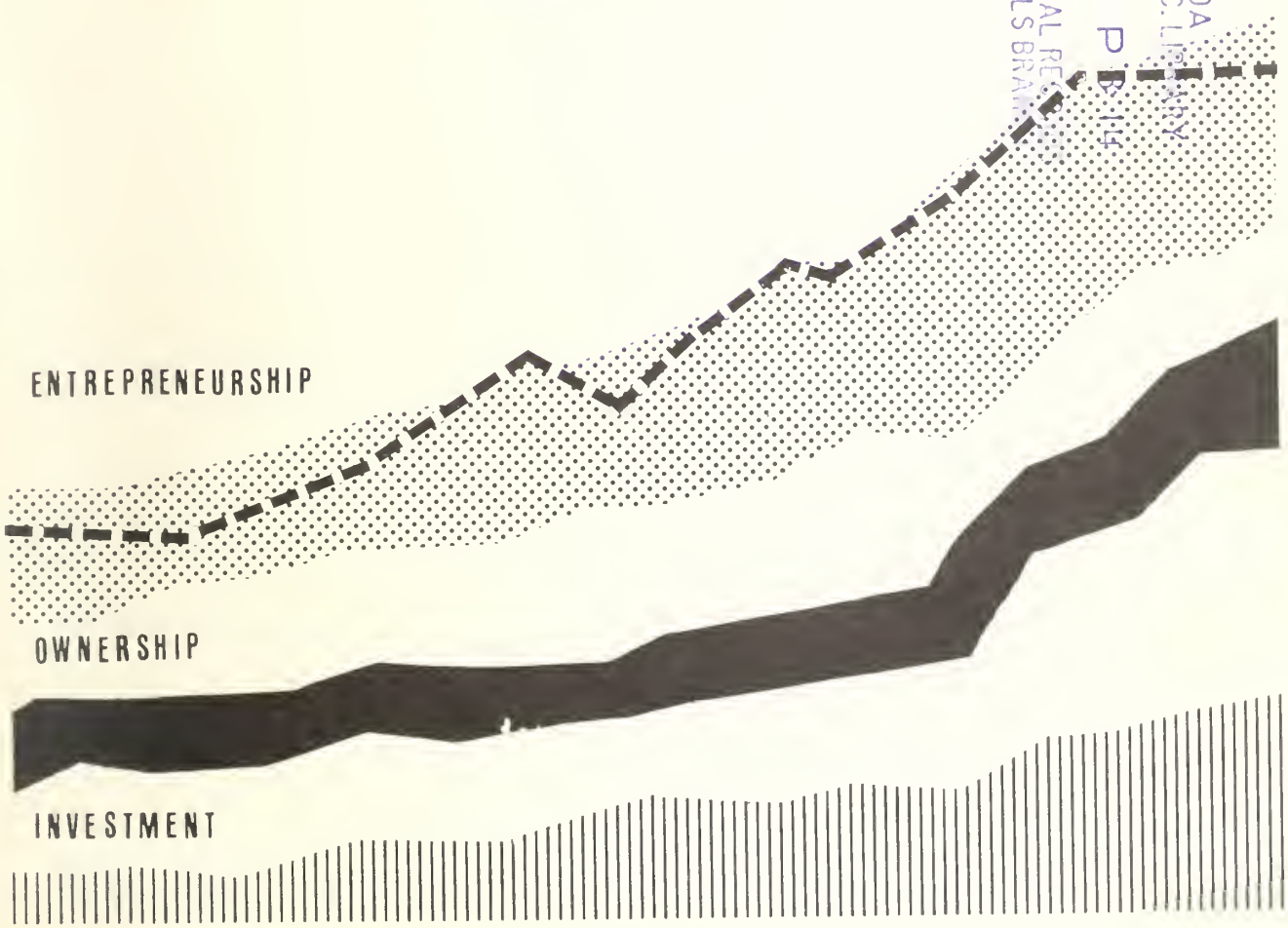
...TITIONING FINANCIAL RETURNS: AN APPLICATION TO THE GROWTH OF FARM FIRMS



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SUMMARY

In analyzing financial management of the farm firm, researchers need a consistent and meaningful procedure for allocating financial returns to the investment, ownership, and entrepreneurial functions of the firm. Partitioning financial returns to these three functions in a consistent manner allows researchers to analyze alternative means by which farm firms may acquire access to the resource services they need. The resource services needed and the means by which they are acquired are, in turn, dependent upon the goals of the firm.

Given particular goals of a farm firm, researchers may test strategies for maximizing annual net cash returns to the firm, or for achieving some given scale of resource use with a minimum amount of investment by the firm. One may compare, with precision, the alternatives of renting or of buying land to be operated by the firm, with respect to the different effects on net worth, rate of growth of firm assets, and annual returns generated to the firm. Such comparisons are relevant because separation of resource ownership and use of resources for farming is common. This report gives the interested researcher an analytical base from which the economics of such separations may be studied.

Investment returns are constant for any given investment, and the rates are set by contractual agreement. Ownership returns consist of the rent that may be obtained by a resource owner during a given period in exchange for temporarily granting his use-rights in a resource to others, plus any net change in the market value of the resource during the period. The latter component, a change in the current value of a resource, is a noncash increase or reduction in current ownership returns and is the equivalent of a capital gain or loss. The cash or rental component of ownership returns may be constant under a cash rent agreement, or variable under a share rent agreement. Entrepreneurial returns are the residual left after production costs have been paid and returns have been allocated to the investment and ownership functions of the firm.

In this study, a firm growth model is used to provide the data for an example of the partitioning process, and of its several results. The starting state is a dryland cash grain farm of modest scale. The only variable in the model is the land control strategy followed in each of five situations. These strategies may be summarized as: (A) Growth in equity; (B) growth in scale by refinancing and land purchase, and later growth in equity; (C) growth in scale by renting, then purchase, followed by growth in equity; (D) growth in scale by purchase on a perpetual land mortgage; and (E) growth by renting, with no increase in landownership.

The data are simulated for each of these five strategic situations over a 30-year period, under assumptions of average and stochastic crop yields. The financial returns are partitioned between the firm and the exogenous sector for the three functions of investment, ownership, and entrepreneurship.

In these simulations, the equity strategy (A) produced the lowest average annual rate of total and cash firm returns, and the lowest returns in absolute dollar terms. The highest rates and absolute amounts of total and cash firm returns were produced by strategies E and D--the rental and the perpetual land debt strategies. This reflects the greater investment leverage of these strategies over the equity strategy.

The proportion of total firm returns contributed by each of the three financial functions--investment, ownership, and entrepreneurship--differed greatly for the five strategies. Because of their residual nature, entrepreneurial returns were the most variable from year to year for all strategies. Investment returns were the most stable because of their contractual nature. For the example used in this report, the rate of entrepreneurial returns was higher than the rates of ownership and investment returns. However, the absolute amounts of entrepreneurial returns varied among the various growth

strategies and with the point in time, over the 30-year growth period simulated.

Severe internal capital rationing was a necessary consequence of the single-valued goal of strategy A, growth in firm equity. The other strategies had increased scale of resource use as a primary goal, with secondary goals of equity or resource ownership. The simulated results indicate that the equity goal is more readily satisfied after a resource scale goal has been achieved. This would suggest that strategies for early and rapid increases in the scale of resources used are more appropriate means toward eventual growth in net worth and/or equity than the more traditional strategy of striving directly for an increase in equity. This result is apparently due to the greater firm earnings that flow from higher investment leverage in the early years of a planning period. Such a result might not obtain if one did not build in secular increasing functions for resource and operating costs.

PARTITIONING FINANCIAL RETURNS: AN APPLICATION TO THE GROWTH OF FARM FIRMS

by

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Research on the financial management of farm firms has increased rapidly in the last few years, and a continuation of this trend is expected. One of the most innovative ideas in the recent literature of farm financial management is Warren Bailey's proposal for the functional partitioning of financial returns.[1] It is a neat and logical method of allocating the earnings of a firm among the functions by whose activities the earnings were generated. In this report, Bailey's method is discussed, and its application to a problem situation in financial management is illustrated.

Specifically, Bailey's method of partitioning returns separates the traditional management process into functional components that are useful as analytical tools in financial-management research. He calls these components investment, ownership, and entrepreneurship. A purpose of this report is to establish a conceptual framework within which Bailey's functional components have analytic rigor. To do this effectively, it is first necessary to describe and define the firm-decision milieu in which the functional distinctions are meaningful. Then, the precise meaning and measurement of the investment, ownership, and entrepreneurship functions are discussed. Finally, the concepts developed are used to analyze the achievement of growth goals for a dryland grain farm, given alternative assumptions about strategies and means for achieving growth.

[1] Firm Growth and Financial Management. Proc. Joint Mtg., Farm Mangt. and Mktg. Res. Committees, Western Agr. Econ. Res. Council, Las Vegas, Nev., Nov. 7-9, 1967.

I. DEFINITIONS AND METHODS

The terminology of even that small part of the literature of economics relating to production and financing in agriculture is highly volatile. The various interpretations to which certain words and phrases are open leads to much confusion. Since it is the purpose of this report to lessen confusion, it is necessary to begin with some explicit definitions of certain terms and concepts as they will be used in this report.

THE FARM FIRM

A "firm" in this report is considered to be a business entity whose primary purpose is the creation (or increase) of monetary utility. Other firms have other purposes, but they do not concern us here. A "farm" is a locus of resources and activities, functionally concerned in the creation of agricultural products. We exclude processing and transport as activities of a farm, since they create place, time, or form utility, and use a primary agricultural product as an input.

A farm firm, by the above definitions, must be a business entity primarily concerned to create monetary utility, primarily by means of agricultural production. Business activities that are not agricultural production are allowed in the firm. Indeed, the firm may well engage in certain processing, storing, transporting, and marketing activities, using the output of the farm as primary inputs. The firm may also engage in activities aimed at the creation of monetary utility that are purely financial in nature, such as investing in the

stock market or putting money out at interest at the local bank. It is also allowed that some production activities of the farm, such as maintaining a saddle horse for pleasure or keeping a registered hog for show purposes, intentionally do not lead to the creation of monetary utility. It is required that the primary purpose of the firm be the creation of monetary utility, and that the primary means toward this goal be agricultural production.

To further clarify the terms "farm," "firm," and "farm firm," one might use a Venn diagram as in figure 1. Space I, labeled "Exogenous," is disjoint from spaces II and III. Space II, labeled "Farm," includes all of the resources, activities, and services related to the physical aspects of agricultural production (such as land, livestock, machinery, and the farm family). Space III, labeled "Firm," includes all of the resources, activities, and services related to the business enterprise.

The subspace defined by the intersection of spaces II and III is the collection of activities, resources, and services that are referred to as "farm firm" in this report. It includes only those points that are members of both spaces II and III, such as land used in production and owned by the firm. The subspace that will be called "farm nonfirm" is defined as those points in space II that are disjoint from space III. Examples would include production activities that are nonbusiness oriented such as a prize hog, and the nonbusiness decisions and activities of the farm family. The term "firm nonfarm" is defined as the collection of points in space III that is disjoint from space II. This subset would include those business activities that are not directly related to the production processes of the farm, such as investments in common stocks, the ownership of an apartment house that is rented out for profit, or storage and marketing of the grain crop.

MANAGEMENT

For purposes of this paper, management is defined as the process of gathering data, of interpreting them, of making decisions, and of

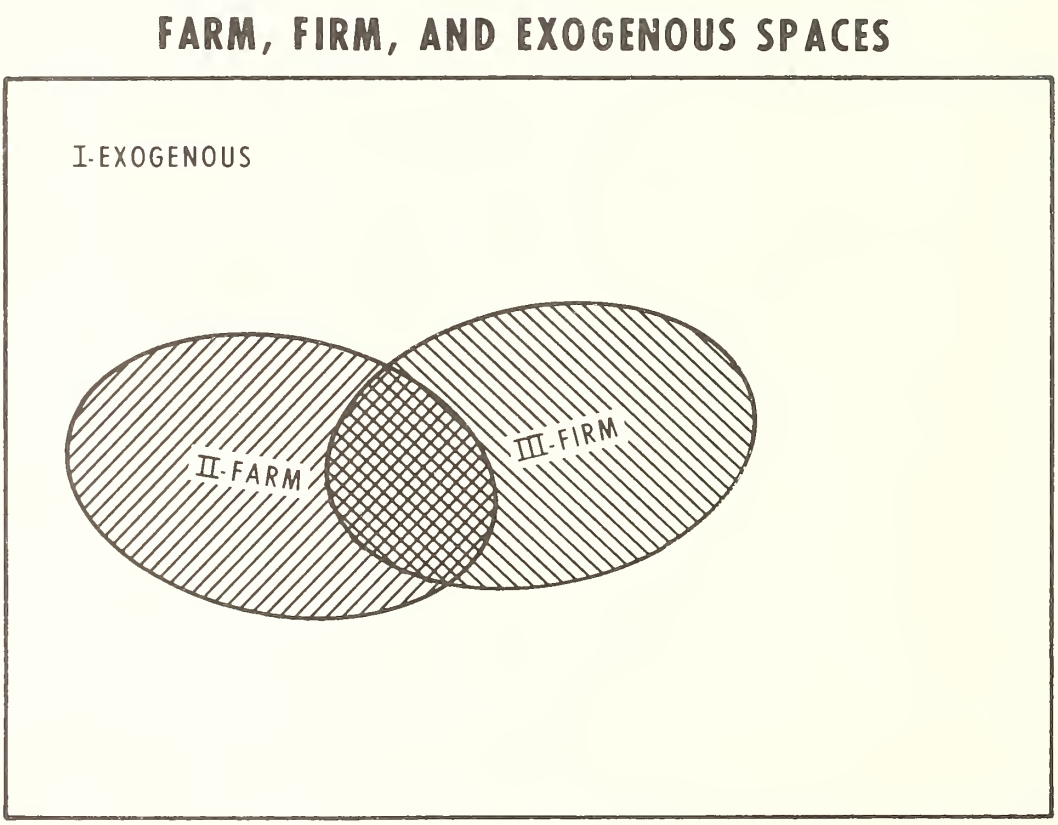


Figure 1

accepting the consequences of decisions made and acted upon in some previous time period.[2] The management process is not mechanistic but very much a human phenomenon. It is a congeries of interacting human goals, attitudes, beliefs, values, experiences, and expectations, constrained by exogenous physical, social, and temporal phenomena. The management process is so complex, in fact, that the social sciences have not yet managed to systematize it for the purpose of simulating it in mechanistic models.

We have succeeded in studying the management process only in terms of its visible effects. We study the results of management, and pin them to some objective scale of success-failure. Sometimes we attempt to correlate results with other quantifiable data, or to predict that given managerial actions will lead to a specified set of results. A great deal of very useful research has been done in which organizational or operational goals were assumed, and then a set of managerial decisions deduced that would optimize the manager's achievement of the assumed goal. Production economics has become a discipline of agricultural economics specializing in the search for production and organizational optima.

FINANCIAL MANAGEMENT

Financial management is becoming another discipline of agricultural economics, allied to production management, but functionally distinct from it. In financial management, it is assumed that the mix of resources and services required for a given production process is known. The focus of research in financial management is on the strategies by which the required resources and services may be controlled, and thereby made available to the production process. In production management research, one deals with physical quantities that are indexed by a price-valuation transform, and then economized upon. In financial management research, one deals with quantities and flows of money resources, and these are indexed back to physical resources and services after the economizing process.

Bailey's method of partitioning returns separates the traditional "management process" into functional components that are of interest for research in financial management. He calls these components investment, ownership, and entrepreneurship. Each of these functions of financial management is discussed in the following paragraphs.

INVESTMENT

Investment is the process of allocating money in the expectation of receiving a larger amount of money in return, at some point or points in the future. Interest is the return to investment; e.g., the quantity of money paid to the investor for the use of his money. Interest is thought to include such components as liquidity and time preferences, and risk. These components are evaluated by the parties to an investment, and may be estimated by the market rate of earning for investments concluded under equivalent circumstances. Investments are distinguished by origin as exogenous or firm investments. Exogenous investments are those in which money is allocated to the firm from an outside source. They are commonly given the generic name "credit." Firm investments are those in which money of the firm is allocated to recipients, either exogenous or endogenous.

The rate of interest (return to investment) in the former case is defined by contractual agreement. Since the money is allocated only once, the rate of interest that the firm must pay for the use of this exogenous money is a constant. It will change only if and when the contractual agreement is renegotiated, and this action defines a separate investment activity.

A complication arises with respect to firm investments. Firm-nonfarm investments are allocations of firm money to an exogenous user, and these carry constant and contractual rates of interest. Buf farm-firm investments are allocations of firm money to the production activities of the farm, and there is no contractual rate of interest defined. Bailey's solution to this problem is to impute a rate of interest to farm-firm investments that is based upon the opportunity rate of return of an equivalent firm-nonfarm allocation of money. This rate of return may be estimated from various data. One estimator is the interest rate that is paid by commercial lenders for deposits of the size and term represented by the farm-firm investment.

[2] Cf. Bradford, Lawrence A., and Johnson, Glenn L. "Farm Management Analysis." John Wiley and Sons, New York, 1953.

Mortgage lenders such as savings and loan associations might be paying 5 percent for deposits, and this could be the imputed rate of return for intermediate to long-term farm-firm investments. Banks might be paying 3.5 percent for deposits of 1 year, and this would be a reasonable rate at which to impute returns on these types of farm-firm investments.

A second set of data that might be used to impute a rate of return on farm-firm investments has been suggested by a report to Congress: Parity Returns Position of Farmers.[3] One could assume that the rate of return to a farm-firm investment was properly estimated by the current dividend yield of Standard & Poor's 500-stock average for the year in question--something like 3.4 percent for 1966. Whatever the particular base by which this rate of return is estimated, it is important that it be a real alternative to the farm-firm investment under evaluation. One should not use the "prime rate" or the "mortgage rate of interest" or other such measures, unless they are real alternative opportunities for the investment of the money for which an imputed rate of return is being sought. They rarely are.

OWNERSHIP

Ownership is defined as the legal claim to the use-rights in a resource, in perpetuity. The owner of a resource may allocate it, or the services flowing from it, to intrafirm uses; he may assign the use-right to an exogenous firm and receive payment (which we call renting); or he may dispose of his claim by selling it. Firm ownership of a resource implies some farm-firm investment in that resource. The reverse is not necessarily true. Firm investment in an exogenous resource need not imply any ownership claim to that resource, and exogenous investment in a firm resource need not imply any ownership claim to the firm resource by the exogenous investor. In theory, the firm investment required to acquire an ownership claim to a firm resource may be arbitrarily small. In practice, exogenous constraints require relatively large firm investment in return for a firm ownership claim. Agricultural land, for instance, may not usually be owned by the firm with less than 10 percent firm investment under land purchase contracts, or perhaps 30 to 40 percent under typical mortgages.

Returns to the investment and the ownership functions have been confused under the traditional systems of accounting in production economics. Bailey suggests an allocation method that allows the returns to these functions to be clearly separated. He establishes a base by assuming that the return to ownership rests on the opportunity rate of return established in the marketplace; for example, the rate of return to a firm on an owned resource is whatever return that the resource will generate if the use-right is rented to an exogenous firm.

From this gross rent, one must first subtract the ownership costs, such as taxes and maintenance, to arrive at an annual net rent. One must then subtract the return to investment, irrespective of whether or to what extent the investment is firm or exogenous. If the resource is subject to changes in value, one must then add or subtract the annual increment or decrement in the market value of the resource. The assumption here is that the market value of the resource is the measure of the opportunity cost of retaining ownership.

The land resource of the firm is most easily assigned an ownership return, since it is the easiest resource on which to obtain such necessary data as rental rates, taxes, and current market values.

Bailey's method assigns the capital gains or losses to the ownership function, and reflects, in fact, the accounting practices of the Internal Revenue Service in this respect. Thus, this method results in an investment return that is constant for any given investment, and an ownership return that may fluctuate year by year according to changes in rental rates, taxes and other maintenance costs, and the market value of the resource. Further, while the returns to the investment function may be either exogenous or firm, the ownership function is always restricted to the firm that has claim to the use rights in perpetuity. A given farm firm either has full ownership in a resource, or it has none at all. If it has none, it acquires use-rights by renting the resource, or by hiring the services that flow from the resource. Thus, investment returns must be allocated among the investors

[3] Senate Document No. 44, 90th Congress, 1st Session, 1968, pp. 12-13.

in proportion to their money contributions, and ownership returns must be allocated in their entirety to the owner of the resources.

ENTREPRENEURSHIP

In Bailey's method, entrepreneurship has a residual claim to the returns generated by the production and financial activities of the farm firm. Entrepreneurship is defined as the activity of making available to the firm those resources and services required by it. Investment and ownership functions may appertain to either "natural" or "legal" persons, but entrepreneurship is always a function carried out by a "natural" person.

The entrepreneur of a farm firm may have an ownership claim to none of the resources, may have a zero investment in the firm, may contribute no labor or managerial decisions to the production processes, and therefore may only function to bring together those inputs required for the firm to operate. At the other extreme, the entrepreneur may be the owner of all resources and the sole investor in the farm firm. He may contribute most or all of the labor used in production activities of the farm. Both of these extremes are atypical in American agricultural production situations. The Bailey method allows a consistent partitioning of returns between investment, ownership, and entrepreneurship over the entire range of this continuum.

The return to entrepreneurship is estimated as the gross income generated by the firm's activities, less the gross rent (which includes returns to investment and ownership in one lump), minus the cost of inputs used in production (operating costs). Gross income must include all money income received by the farm firm, plus inventory changes and capital gains or losses credited to resources during the accounting period.

In practice, it may be impossible to estimate the ownership returns to some farm-firm resources (such as livestock and machinery). In these cases, ownership returns to firm resources will be included in the residual returns to entrepreneurship, with consequent errors in both estimates. The return to the function of entrepreneurship cannot be expressed as a rate of recovery of some specified money allocations, as is the case for returns to the other two functions. There is no money allocation that is not already accounted for by these functions. The favored method of quantifying entrepreneurial returns is to compute the ratio between total gross income generated and the net residual after all other claims have been met. This is more of an efficiency than a rate-of-earning criterion. It is a reasonable estimator, especially when ownership and investment returns can be partitioned accurately between firm and exogenous owners and investors, and when the payments for labor and management can be estimated and included in the annual operating costs of the farm firm.

II. A PARTICULAR MODEL

In the previous section, the method of partitioning returns among the three functions of investment, ownership, and entrepreneurship was discussed. In this section, an illustration of this method in problems relevant to research in farm financial management is considered.

A considerable amount of research has been reported in recent years on various aspects of firm growth. In approaching growth problems, most of these reports have focused on the economic efficiency of resource organization and allocation. Bailey's method allows research on the same problems, focusing on the efficiency of the financial management of resources and services used. The data used to illustrate this application of Bailey's method of analysis were taken in large part from a study published several years ago by LeRoy Rude.[4] These data were selected primarily because they were available, and of sufficient detail to allow the calculations required for this example. They are also advantageous in that they represent a single-enterprise production system, and the analysis can therefore be greatly simplified.

STARTING STATE

The first step in this example requires some definitional spadework. The farm firm is defined by a starting state including 400 acres of cropland (one-half of which is cropped any

[4] Land Use Alternatives for Dryland Cash-Grain Operators, North-Central Montana. Agr. Econ. Rpt. No. 9, Montana Agr. Expt. Sta., Bozeman, Mont. November 1959.

given year), that is owned by the firm. The exogenous investment in the land resource is $21,000, on a 30-year, 5-percent mortgage, leaving a farm firm investment of $9,000 in land. The machinery is entirely a farm-firm investment, and has a current value of $5,432. The financial resources of the farm firm in the starting state are rounded out by cash holdings of $4,000. The total value of the resources controlled by the farm firm in the starting state is $39,432, of which $18,432 represents farm-firm investment. The firm is assumed to be a sole proprietorship.

Growth, however defined, can hardly take place in a static environment. For this example, the environment was assumed to have changed in several of its dimensions. The current (market) value of farmland was assumed to have increased by 3 percent each year. The capital gains component of owned land, and the cost of acquiring additional land through ownership, were assumed to have increased at the same rate over time. The investment cost of machinery and the variable production costs were assumed to have increased by 2 percent per year, which may reflect something like an aggregate rate of inflation in the exogenous sector. It was also assumed that the production management skills of the operator increase with time. This is built into the example by allowing the yield to increase by 2 percent per year. A cost-price squeeze is simulated by assuming a constant factor price of $1.60 per bushel for the grain produced.

Since the example is concerned with financial management, it includes activities that take advantage of the Internal Revenue regulations governing tax and depreciation systems. The machinery owned by the farm firm is depreciated item-by-item on a declining balance system. Tractors, trucks, and combines are depreciated over a 7-year period and all other machinery over 10 years. Any item of machinery is automatically replaced when its expected life reaches zero, and full advantage is taken of the additional first-year depreciation and the investment credit allowance on new machinery. There is reason to hypothesize that returns to entrepreneurship could be increased, if enough flexibility were introduced into the machinery replacement system to allow machinery to be replaced a year or two before or after its expected life reached zero. This would reduce the tax liability in years of exceptionally high income, to the extent that such years were reasonably coincident with those in which major machinery items required replacement. It is also reasonable to suppose that some advantage could be gained from the tax loss carry-forward and carry-back provisions. But both of these provisions greatly complicate the analysis, and were left out of this example for that reason. The income tax is estimated by Schedule II of the 1966 income tax forms. For simplicity, the personal exemption is estimated as:

$$E = \$2,400 + .07G$$

where G is the gross firm income, and there are four dependents.

A major component of the production costs of the farm are variable with the number of acres operated. These are lumped into one figure of $3,445 in the year of the starting state. Costs that are fixed over time include personal property and real estate taxes, insurance on trucks, etc.

Exogenous investments are available in the form of machinery, mortgage, and annual operating credit. Mortgage credit requires a farm-firm investment of 20 percent of the total, the exogenous investment being acquired by the firm over a 30-year period, with a 5-percent interest charge paid on the annual balance. Machinery credit requires a farm-firm investment of a third of the net cost of the machinery. The balance must be transferred from the exogenous investor to the firm in two equal annual installments, along with an interest payment of 6 percent per year on the balance. There is some question whether or not the money laid out for annual operating costs constitutes an investment, but there is no other place in the system to account for firm cash or its substitute, operating credit from exogenous sources. At any rate, the firm in this example uses production credit as a substitute for cash, and pays 7 percent per year for the privilege. It is assumed that these credit forms of exogenous investment are not externally rationed.

Another form of exogenous investment is the nonfirm land resource, the annual use-rights to which are acquired by the firm in return for one-third of the crop produced thereon; a gross rent of one-third share. Firm-nonfarm investments are not present in the starting state, but are allowed in some variations of the example. These are a means of transferring excess

money to alternative uses outside of the farm. For simplicity, firm-nonfarm investments are assumed to earn 6 percent per year, and must be made in multiples of $1,000.

If the farm grows in terms of acres operated, it must also grow in terms of the machinery complement. Additional land may be acquired through ownership or renting, but only in multiples of a quarter-section (160 acres). Likewise, the machinery complement required has discontinuities at land sizes of 840, 1,200, and 1,700 acres. The variable production costs are functions of acres operated, and these will show discontinuities at the same points at which the acres operated change.

The data on which this example was based did not include a specific labor requirement, and the cost of acquiring labor services is not included in the variable operating cost factor. But, since the example is based on a single proprietorship, it did not seem unreasonable to substitute a family consumption item in lieu of a cash labor cost. The following consumption function was assumed for this example:

$$C = \$2,500 + .10(G - \$2,500)$$

where $2,500 per year is the minimum cash outlay required by the proprietary family. The cash outflow for consumption is assumed to increase beyond this minimum as a function of G, the annual gross firm income.

GROWTH STRATEGIES CONSIDERED

To conduct research on farm-firm growth problems properly, one must first define the criteria by which growth is to be measured, and then develop the data by which the most appropriate strategies for growth can be discovered. For this example, growth was defined in several ways, Bailey's method was applied to the data for each definition, and the computed results were compared over a 30-year period.

Situation A is a kind of control or check, against which others are compared. It was assumed for A that the goal of the farm firm is to increase "equity": the ratio of total resources controlled to total farm-firm investment plus accumulated capital gains in the firm land resource. The goal could be stated as one of reducing the exogenous investment required by the farm firm.

The first simulation using this definition of growth did not come to a happy conclusion. The firm was reduced to the point of bankruptcy in about 10 years. The basic problem seemed to have been that the income generated by the production activities, at the scale of operation defined by the starting state, was less than that required to cover the necessary outflows of money. This was in part due to the inflation in operating costs and in the replacement costs of machinery.

The definition of growth was then modified to allow the firm to increase the acres operated, as a survival requirement, while the primary goal was still to reduce the exogenous investment used by the farm firm in its operations over a 30-year period. Thus, the base situation is one in which scale increases, but under conditions of rather extreme internal rationing. The proprietor uses exogenous investment (credit) because it is necessary, but does so as conservatively as possible.

Situation B uses growth as a means toward a primary goal of "adequate scale." The proprietor defines his scale goal as a farm production operation based on 2,000 cropland acres, with the attendent complements of machinery investment and operating costs. The strategy used to achieve growth by this proprietor is that of refinancing the mortgage on the firm's land resource. The capital gains represented in the 3 percent per year increase in land values are converted to money through periodic refinancing, and this money is invested in further firm land resources, or in the machinery complement. When the scale goal has been achieved, the proprietor adopts a goal of reducing the exogenous investment as in situation A.

Situation C is similar to B above, except that the proprietor is willing to achieve his scale goal by annual renting of the use-rights to the land resource until the scale goal is achieved. After that, the firm will seek to become an owner of the land resource, and then to reduce the exogenous investment required to own land. This proprietor will also use the strategy of refinancing to translate capital gains on the owned land resource into money, which will be reinvested in further machinery or firm-owned land.

In situation D, an exploratory assumption has been made that departs from current real alternatives. It is assumed that the firm can acquire ownership of the land resource with a 30-percent farm-firm investment, and that the exogenous investment need not be transferred to the firm over time. This is a condition of perpetual debt, in which the exogenous investor (the mortgage holder) accepts an annual interest payment and does not require that the firm retire the indebtedness over time. Any surplus money generated by the farm-firm production activities is allocated to firm-nonfarm investments, rather than to an increase in farm-firm investments.

For situation E, it is assumed that the proprietor chooses to forego the capital gains (ownership returns) on the land resource. The scale goal remains the same as in the previous situations, but is achieved by renting the annual use-rights to the land resource (beyond the owned land included in the starting state). Money surpluses that are generated by the activities of the farm firm are allocated to firm-nonfarm investments. The proprietor of this firm will therefore follow a growth strategy indentical to that in situation C, up to the point where the scale goal is satisfied. Thereafter, the growth strategy will be similar to that used in situation D.

The above five basic situations were simulated over 30-year periods under assumptions of average and stochastic crop yields, thus generating 10 series of annual operating data. The form used in the simulations, and in partitioning the returns among the three functions, is reproduced as table 1. For illustrative purposes, sample years from the simulation for situation C, in the constant yield series, have been used. For ease of computation, the capital gains on the firm-owned land resource have not been added into the gross income figure; the gross income figure represents cash income only. Also, the figure for gross rent has been used in calculating income tax liabilities, while that for net rent has been used in computing the net cash flows. The equivalent alternative would have been to deduct the landlord's share of the crop from gross income, and his share of seed, fertilizer, and harvesting costs from the figure for variable production costs, and from the rent component of the annual cash flows.

III. ANALYSES: GROWTH IN RETURNS

The results of simulations such as that summarized in the above example may be applied to a number of analytical purposes. It should be remembered that the example had land control as the only variable strategy. Strategies for depreciation and replacement of machinery, the use of credit, the timing of product sales, and minimizing income tax liabilities were all constant over the five situations simulated. Therefore, this example does not provide the data for answers to questions about appropriate strategies for goals other than, or in addition to, growth via land control. In this section, the analyses that are drawn from the data are restricted to that narrow segment of financial management research for which land control strategies might be appropriate means.

The goals assumed for this example have to do with growth of the farm firm. The primary means toward this goal is one of these five strategies:

A. Increase firm equity, credit internally rationed;
B. Increase scale, then equity, refinance land debt;
C. Increase scale by renting land, then buy land;
D. Increase scale via perpetual land debt, surplus to firm-nonfarm investments; and
E. Scale increase via renting, surplus to firm-nonfarm investment (no increase in ownership of land).

The flows of annual returns generated for this example include both total firm returns and cash firm returns. The difference is that the latter excludes the capital gains component of the ownership returns to land. Cash firm returns are a measure of the surplus available for either cash carryover or reinvestment, or of the annual cash deficit from the year's activities. This measure does not include the cash inflows from credit, the noncash potential inflow from increases in the current value of land, or the noncash potential outflow from decreases in the book value of machinery of the firm.

Table 1.--Illustrative annual simulations and partitioning of returns to investment, [illegible], strategy C (rent-buy), average yields

Item	Year				
	1	2	3	4	5
	Number				
Acres owned	400	400	400	1,000	1,000
Acres rented	--	64	80	80	80
Total acres operated	400	1,240	1,480	2,080	2,080
	Dollars				
Gross farm income	7,047	19,718	28,500	61,888	61,888
Variable production costs	1,378	6,608	7,980	21,900	21,900
Machinery taxes	80	128	220	170	170
Truck insurance	50	50	50	50	50
Interest:					
Production	--	--	--	--	--
Machinery	--	736	605	--	--
Land	1,015	875	700	3,667	3,667
Ownership costs, firm land	144	152	164	734	1,468
Ownership costs, nonfirm land	--	198	326	134	--
Total farm cash cost	2,667	7,639	9,625	21,119	27,255
Gross rent	--	4,058	6,720	12,780	--
Depreciation, machinery	3,296	4,472	3,560	1,367	1,367
Tax deductions	2,893	3,780	4,395	9,962	8,723
Net farm income	--	--	4,200	15,252	27,346
Investment credit	341	153	--	--	--
Taxable income	--	--	4,206	15,522	27,346
Income tax paid	--	--	659	3,140	6,265
Investment:					
Machinery	1,531	731	--	--	--
Land	--	--	--	22,086	17,629
Total	1,531	731	--	22,086	17,629
Credit paid:					
Production	--	--	--	--	--
Machinery	--	6,134	5,935	--	--
Land	700	700	700	4,333	5,679
Total	700	6,834	6,635	4,333	5,679
Net rent paid	700	3,270	5,414	2,195	--
Consumption outflow	2,954	4,222	5,101	7,338	8,426
Total cash outflow	7,852	22,696	27,434	60,692	59,213
New credit:					
Production	--	636	--	--	--
Machinery	3,062	1,462	--	--	--
Land	--	--	--	20,000	--
Total	3,062	2,098	--	20,000	--
Credit balance:					
Machinery	3,062	7,596	4,146	--	--
Land	20,000	17,500	14,000	141,384	70,051
Total	23,362	25,732	18,146	141,334	70,051
Cash surplus	3,188	--	6,726	9,533	5,145
Value, owned land	30,000	33,768	39,148	220,954	353,500
Value, owned machinery	6,644	10,692	10,485	14,878	27,906
Value, owned resources	39,832	44,460	56,359	245,365	378,651
Total obligations	22,362	25,732	18,146	141,334	70,051
Firm net worth	16,470	18,728	38,213	104,031	308,651
Value, rented land	--	54,029	93,955	42,086	--
Value, total resources	39,832	98,489	151,314	287,451	378,651
Land investment to date	9,700	12,500	16,000	53,334	172,031
Annual capital gain, land	0	983	3,140	5,249	14,295

Table 1.--Illustrative annual simulations and partitioning of returns to investment, ownership, and entrepreneurship, strategy C (rent-buy), average yields--continued

Item	Year				
	1	5	10	20	30
	Dollars				
Exogenous resource:					
Land, mortgaged	20,300	17,500	14,000	141,344	70,000
Land, rented	--	50,946	81,350	36,304	--
Machinery	3,062	7,596	4,146	--	--
Cash borrowed	--	636	--	--	--
Annual capital gain, rented land	--	1,574	2,736	1,226	--
Total	23,362	78,252	102,232	178,864	70,000
Imputed interest:					
Owned land	1,350	1,350	1,350	8,760	10,892
Machinery	365	588	577	818	1,100
Cash	207	41	437	620	334
Total, firm only	1,922	1,979	2,364	10,198	12,326
Rented land	--	2,293	3,661	1,634	--
Total	1,922	4,272	6,025	11,832	12,326
Interest paid:					
Firm land	1,015	875	700	7,067	3,500
Machinery	184	456	249	--	--
Cash borrowed	--	45	--	--	--
Total	1,199	1,376	949	7,067	3,500
Investment return:					
Land	335	475	650	1,693	7,392
Machinery	181	132	328	818	1,100
Cash	207	-4	437	620	334
Firm	723	603	1,415	3,131	8,826
Gross rent:					
Owned land	2,349	2,536	2,800	14,330	20,780
Rented land	--	4,058	6,720	2,730	--
Total	2,349	6,594	9,520	17,060	20,780
Net rent:					
Owned land	2,200	2,384	2,636	13,596	19,732
Rented land	--	3,860	6,394	2,596	--
Total	2,200	6,244	9,030	16,192	19,732
Ownership return:					
Firm land	850	2,017	2,426	10,045	19,732
Exogenous land	--	3,141	5,469	2,188	--
Total	850	5,158	7,895	12,233	19,732
Production expenses	1,508	5,055	8,815	16,939	22,920
Entrepreneurial return	2,760	4,433	5,771	9,876	7,379
Total returns:					
Firm	4,333	7,053	9,612	23,052	35,340
Exogenous	1,199	6,810	10,079	10,889	3,500
All resources	5,532	13,863	19,691	33,941	38,840

CAPITAL GAINS

The capital gain (or loss) component of ownership returns is a potential return, until it is captured by some transaction with the exogenous (nonfirm) sector. This capturing, or realization, may be accomplished by transferring ownership of the resource to an exogenous firm; a sale. The potential capital gain component of ownership returns may also be captured through its inclusion in the value base upon which an exogenous investor advances money to the firm, (i.e., it may be used as a basis for credit expansion). If there has been an increase in land values beyond the actual investment value, this potential may be realized in the negotiation or refinancing of a land mortgage based on the current value. Since the firm receives this increment of value, it should be treated on the books as an updating of the investment value of the land resource. It is not clear how such a revaluation should be treated for capital gains tax purposes, but there is no doubt about how it should be treated for purposes of analyzing the firm business. Other than selling the land or refinancing a mortgage, there is no other avenue open to the proprietary firm by which the potential return indicated by the capital gains component of the landownership function can be transformed into real money, and used to further the financial affairs of the firm.

MEASUREMENT OF RETURNS

Economic discussions, particularly those of the academic variety, tend to treat returns as earnings ratios. The investment return on common stocks is usually measured by the ratio of the money dividend received in a given accounting period to the total money invested in that stock during that accounting period. Similarly, the return on investment in land is usually measured by the ratio of the net rent received in a year to the investment made. Thus the return to investment may be confused with that to the ownership function.

But the manager of a proprietary firm may be interested in the absolute dollar amount of the return to his financial activities. He may be at least as interested in the amount earned as in the earning ratio. Most managers would prefer earning 4 percent on a $100,000 investment to earning 10 percent on a $1,000 investment. The proprietor may prefer the $4,000 return to the $1,000 one, apart from the rates of earning that these sums represent. The lesser amount may be below the proprietor's threshold requirement of income for the survival of himself and his family. Thus, the more purely economic criterion of rate-of-return may have to be constrained by a hierarchically superior threshold requirement, expressed in absolute dollar terms. The returns reported in this example sometimes are given in absolute dollar amounts, and sometimes as rates of return.

EARNINGS RATES WITH AVERAGE YIELDS

Figure 2 reports the earnings rates for the five land control strategies under the average yield assumption. The rates are calculated for gross firm product, total firm returns, and cash firm returns, each formed as a ratio with firm investment. The gross product ratio shows a generally decreasing trend with time. Since the quantity of resources used by the firm is increasing over time, one would judge that the data reflect a declining marginal productivity of resource and service inputs, or perhaps of entrepreneurship.

The difference between the gross product and total returns ratios is a measure of the quantity of cash flows to the exogenous sector each year. This flow includes production costs, debt servicing, family consumption outlays, rent of land, tax payments, etc. The narrowing of this area of cash flows with time can only be due to increases in firm equity. As equity increases, the cash required to service the firm's debt must decrease. There is a substantially greater spread between the gross product and the total returns ratios for strategies C and E when land is rented compared with the other three strategies where land rent is an intrafirm (noncash) cost.

Tables 2 and 3 report the ranges, average, variance, and the coefficient of variation for these total and cash income earning rates. These statistics were calculated without removal of any trend line, and assuming that the observations were adequately represented by a linear least-squares fit.

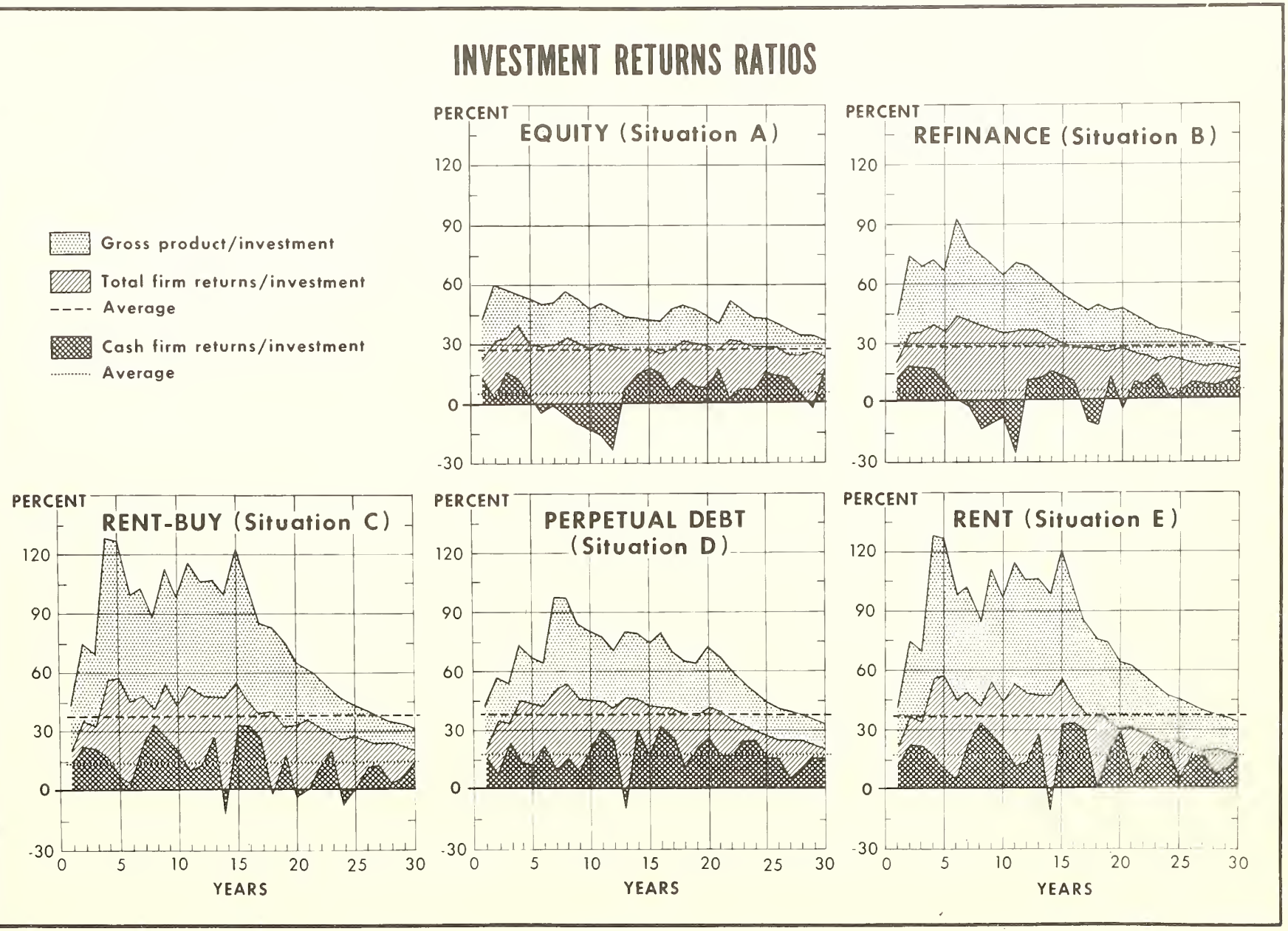

INVESTMENT RETURNS RATIOS
Gross product/investment
Total firm returns/investment
Average
Cash firm returns/investment
Average
PERCENT
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
120
90
60
30
0
-30
0
5
10
15
20
25
30
YEARS

Figure 2

Table 2.--Ratio of total annual firm returns to firm investment, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Percent				
A (equity).....	39.3	[illegible]	[illegible]	[illegible]	[illegible]
B (refinance-buy).....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C (rent-buy).....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D (perpetual debt).....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E (rent).....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3.--Ratio of annual cash firm returns to firm investment, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Percent				
A (equity).....	16.9	-23.4	5.0	10.7	2.14
B (refinance-buy).....	19.0	-25.5	5.6	11.1	1.98
C (rent-buy).....	33.3	-11.0	13.8	12.2	0.88
D (perpetual debt).....	31.4	-9.7	17.3	8.7	0.5
E (rent).....	33.5	-11.[illegible]	17.1	10.5	0.62

ABSOLUTE EARNINGS WITH AVERAGE YIELDS

Figure 3 shows the annual and the total cash firm returns in absolute dollar amounts, rather than as earnings ratios. Tables 4 and 5 report the same parameters as tables 2 and 3, for these absolute data. The discontinuities apparent in the cash firm product line indicate the points in time when increments of land were added to the resource bundle of the firm. For situation C (rent-buy), the land so acquired was controlled via renting through year 15, and thereafter was transferred by stages from exogenous to firm ownership. Situation E (rent) followed the same pattern through year 15, but continued to rent these increments of the land resource, and allocated reinvestable cash surpluses to firm-nonfarm investments.

A comparison of the sample data in tables 2, 3, 4, and 5 gives some substance to the earlier discussion of amounts earned versus the rate of earning. One might be tempted to prefer strategy A (equity) over B (refinance-buy) on the criterion of average annual earning rate of total firm returns. The earning rates of 28.6 percent for A and 29.6 percent for B are not greatly different, and A shows less than half of the variation of B. But if one looks in table 4 at the absolute amounts earned, one discovers that B averaged $21,500 per year in total firm returns, while A averaged only $10,400.

AVERAGE ANNUAL RETURNS

If one is made uncomfortable by the use of the above random-normal statistics in an obviously dynamic time series situation, then one might consider the rate of growth exhibited by these strategies as a selection criterion. This growth rate is estimated here as an average annual increment, or a linear trend line. Situation D (perpetual debt) looks as though a quadratic fit would more closely approximate the data. Perhaps some of the other sets of data exhibit growth at an increasing rather than at a constant rate.

The calculated average annual growth rates for the five strategies may be summarized as:

	A	B	C	D	E
Total firm returns	17.3	38.0	39.1	43.4	34.0
Cash firm returns	21.2	46.7	45.4	37.3	54.3

Each rate is a percentage increase on the first year as a base, giving a linear trend over the 30-year period of the example. One might also

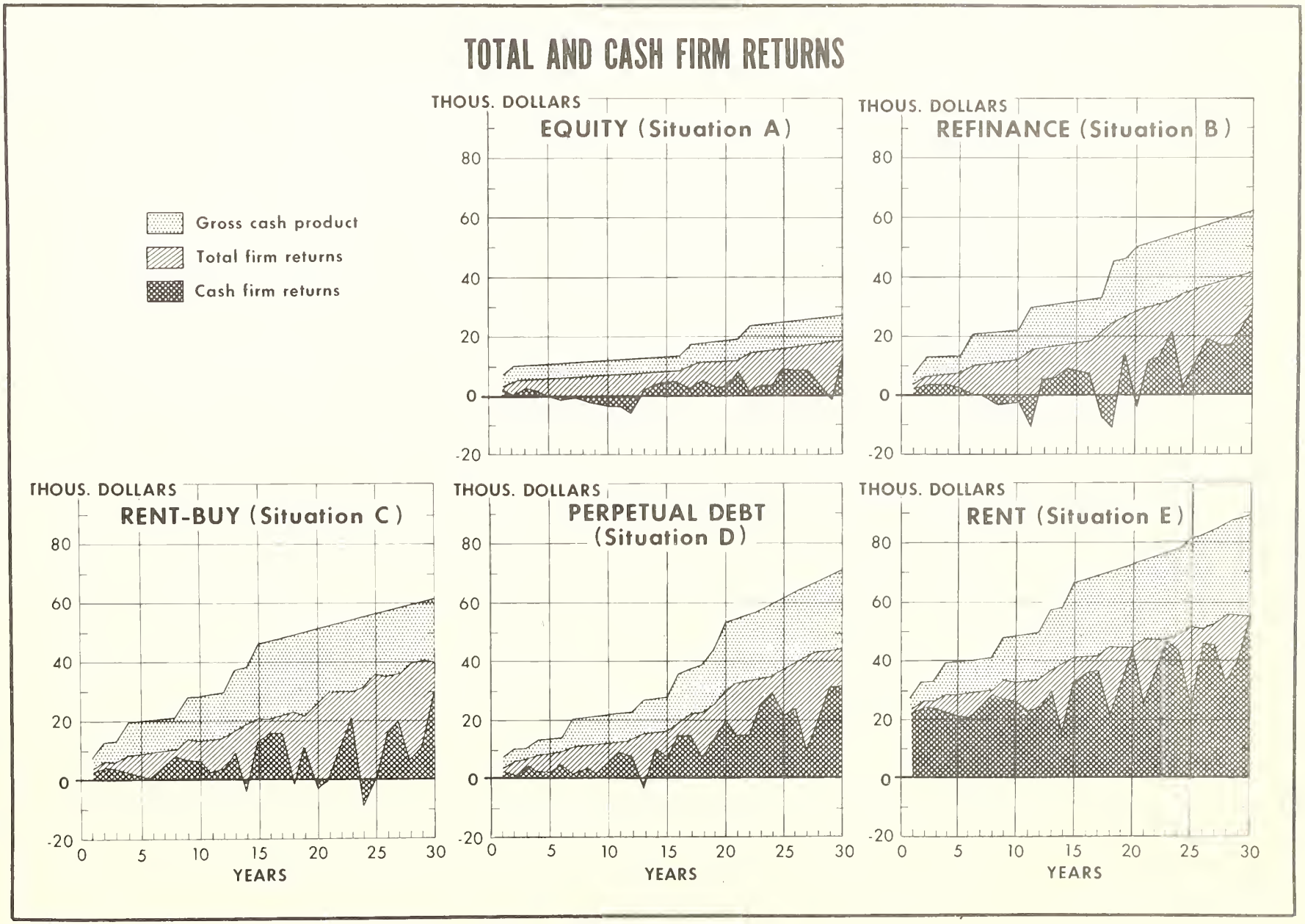

TOTAL AND CASH FIRM RETURNS
Gross cash product
Total firm returns
Cash firm returns
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
80
60
40
20
0
-20
0
5
10
15
20
25
30
YEARS

Figure 3

Table 4.--Total annual firm returns, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Thousand dollars				
A (equity).....	19.3	3.6	[illegible]	[illegible]	[illegible]
B (refinance-buy).....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C (rent-buy).....	[illegible]	3.4	[illegible]	[illegible]	[illegible]
D (perpetual debt).....	[illegible]	3.4	11.9	[illegible]	[illegible]
E (rent).....	39.8	3.4	10.9	[illegible]	[illegible]

Table 5.--Annual cash firm returns, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Thousand dollars				
A (equity).....	14.0	-6.0	2.5	4.2	1.68
B (refinance-buy).....	29.4	-10.8	6.2	9.9	1.60
C (rent-buy).....	28.6	-8.7	6.6	8.4	1.27
D (perpetual debt).....	31.3	-3.2	11.6	9.6	0.83
E (rent).....	34.2	-4.2	10.9	9.7	0.89

express the average annual growth in absolute dollar terms as:

	A	B	C	D	E
Total firm returns	620	1362	1336	1486	1161
Cash firm returns	466	981	953	1044	1140

RETURNS TO ALL RESOURCES

Up to this point, the examination of the data of this example has concentrated on the aggregate returns for the five strategies. Bailey's partitioning technique also allows a closer, and perhaps more interesting, look at the financial affairs of this firm. As one checks on the system, one might ask how these five strategies compare if one includes total returns to all resources used, whether firm or exogenous. One can calculate the average of total returns per acre of land resource used each year as follows: (A) $17.54, (B) $17.04, (C) $18.22, (D) $18.46, and (E) $19.74. The results in absolute dollar terms may be graphed over the time period as in figure 4. In this case, strategy A is well behind the other four strategies, due to the substantially smaller

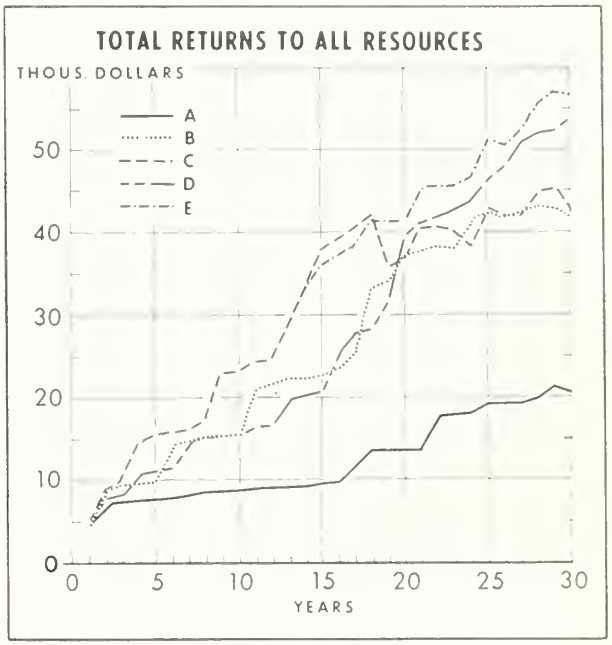


Figure 4

scale of the farming operation. Returns to scale in terms of acres operated would seem to be a dubious hypothesis, according to these data.

A third indicator of interest might be the average annual value, or cost, of controlling the total resources used by the firm. In this case, the datum of measure is the sum of cash operating costs, the imputed gross rent for the

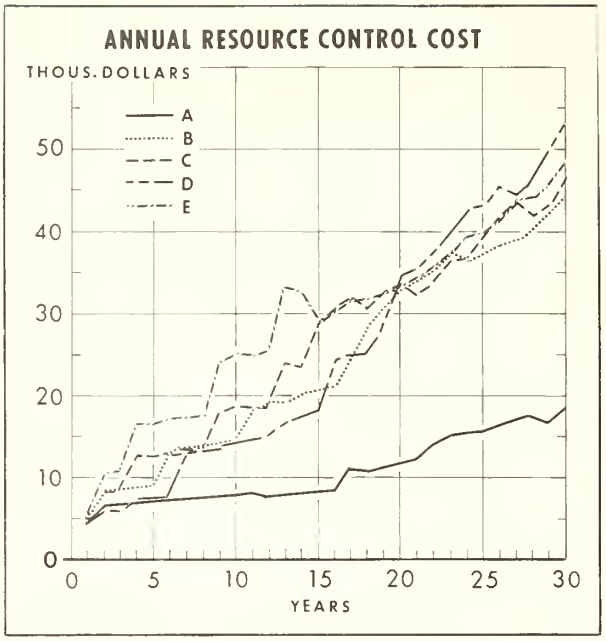


Figure 5

land resource, the annual depreciation and interest charge for machinery, and the credit charge. Figure 5 shows the trends in this annual resource control cost figure for the five strategies. The pattern is similar to that of the total returns to all resources in the previous set of data.

IV. FIRM RETURNS PARTITIONED

The system is so constructed that the investment returns per dollar invested, whether firm or exogenous, must be the same for all strategies, and for all dollars in similar investment categories. The ownership returns, however, may vary between strategies according to the time in the series at which increments of the land resource were first owned by the firm. The capital gains component of the land-ownership function increases at the rate of 3 percent per year. Figure 6 shows the cash and capital gains components of land ownership returns for the first four strategies over the 30-year period. Situation E (rent) is not shown,

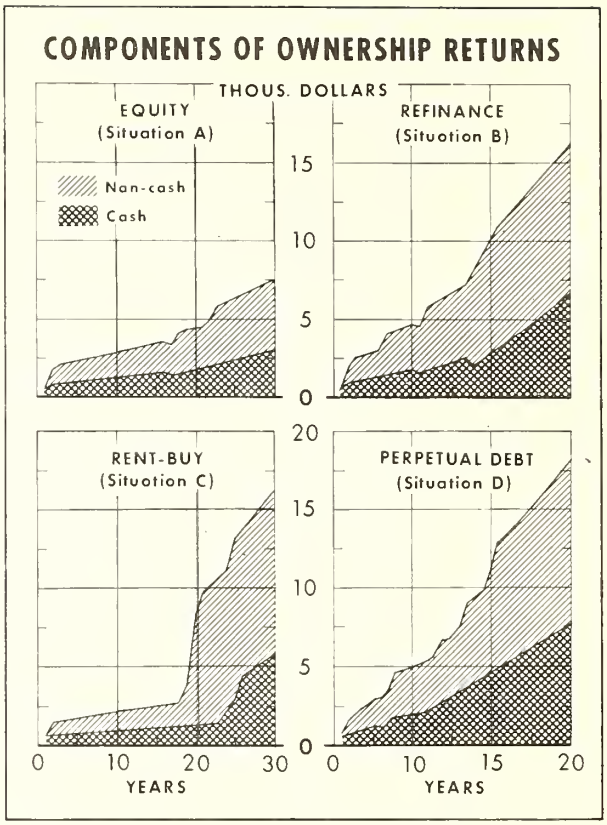


Figure 6

since no land was transferred to firm ownership after the starting state. The capital gains component in this case shows a constantly increasing trend throughout the planning period.

One might note the almost equal split between the cash and the potential returns to land ownership in situation C (rent-buy) in the earlier years of the series. This continues at a low level as long as the bulk of the land is rented. The change in this relationship is abrupt between years 18 and 24, when the firm acquires ownership in all of the land used in its farming operations. Contrast this with situation D (perpetual debt) in which the cash share of landownership returns increases linearly once the scale goal is achieved, while the potential (capital gains) share increases in a roughly geometric fashion.

TOTAL FIRM RETURNS

Figure 7 shows the partitioning of total firm returns among the three functions. Strategy A (equity), aimed primarily at growth in equity, shows a relatively steady relationship between the three functions throughout the 30-year planning period. This is true also for situation B (refinance-buy), its aim being growth in land scale, and its primary means of growth refinancing land debt.

In situation C, however, the entrepreneurial returns far outweigh the combined returns to the other functions as long as the scale of the land resource is increased through renting. When the firm begins to transfer the land resource that it uses from the exogenous to the firm sector, the ownership returns become almost as important a component of total firm returns as entrepreneurial returns. By the end of the planning period, the returns to these two functions are almost identical in size, and constitute three-fourths of the total firm returns.

For strategy D (perpetual debt) the entrepreneurial and ownership returns proceed approximately as coequals, and are the bulk of the total firm returns, up to the point where the scale goal is achieved. But as reinvestable surpluses are allocated to a larger and larger quantity of firm-nonfarm investments, the investment return component begins to increase at a rate in excess of the growth rates of the other two functions. By the end of the planning period, the investment returns are no longer an insignificant proportion of the total, though not yet equal to the returns to the other two functions. It seems reasonable to hypothesize that investment returns to the firm will be minor under the assumed conditions of perpetual debt on the land resource used. The majority of the investment returns are taken by the exogenous investor in the land resources owned by the firm under this condition.

In strategy E (rent), the entrepreneurial returns are by far the most important component of total firm returns under the assumed conditions of this strategy. The investment and ownership components of firm returns are minor throughout the first half of the period, because the absolute amount of firm investment changes only slightly (in the machinery inventory), and the land owned by the firm changes not at all. The investment return increases, more or less linearly, from year 15 as the reinvestable surpluses are allocated to firm-nonfarm investments. The ownership return increases linearly on a modest base over the entire planning period.

FIRM RETURNS UNDER STOCHASTIC YIELDS

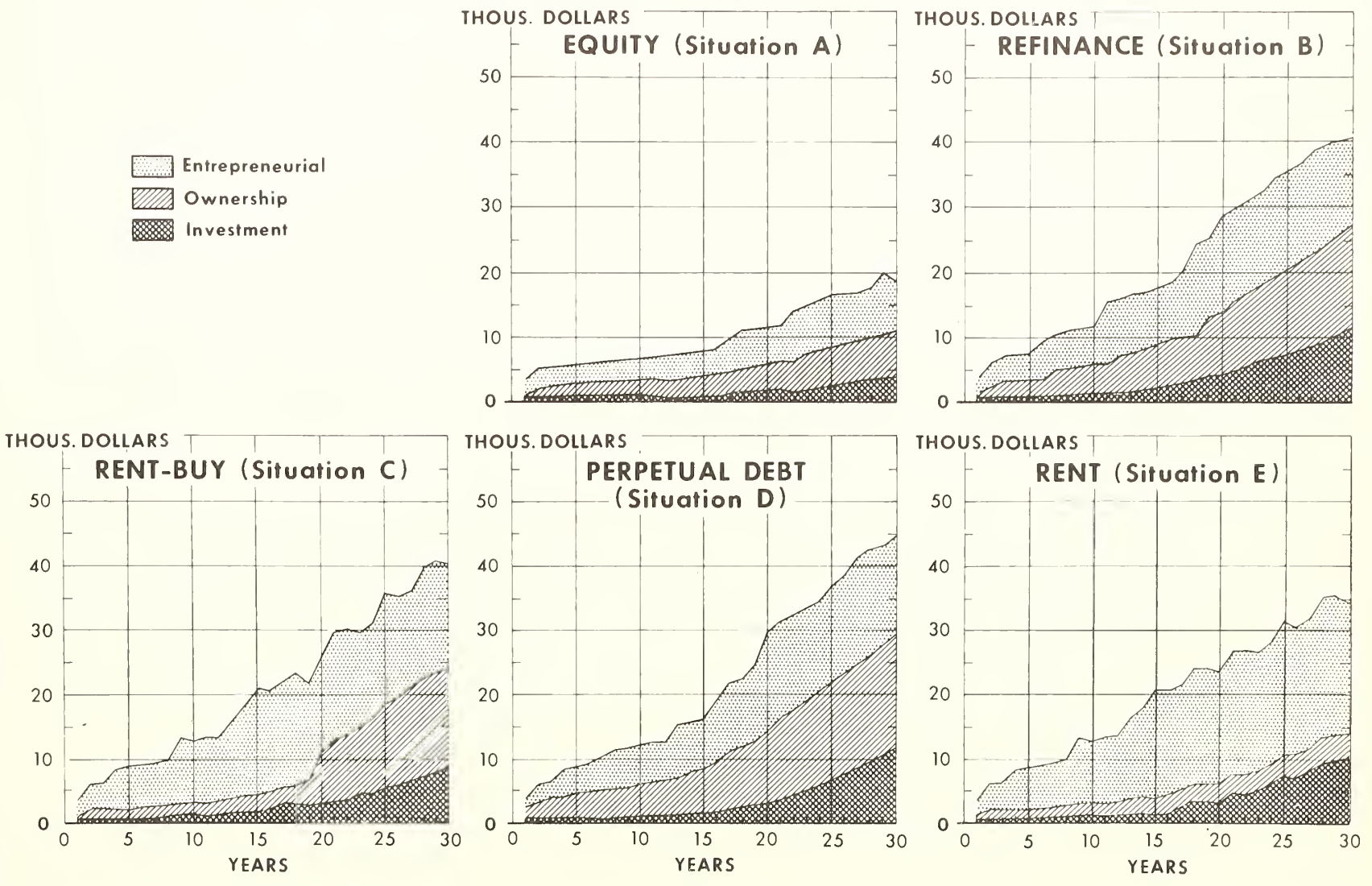
Figure 8 shows the same data as figure 7, but for the stochastic yield assumption instead of average yields. The patterns here are not substantially different in terms of the changing relationships of returns to the three functions. The returns are generally lower in absolute dollar amounts for the stochastic than for the average yield assumption and are, of course, much more variable from year to year.

One might note the five "bad" years, 2, 5, 10, 19, and 28, that occur in this series. Investment returns are not affected by these poor crop yield situations, since the investment values of the resources are not functionally related to crop yields experienced over the short run. Ownership returns are affected by poor, and by exceptionally good, crop yields, since these returns are imputed from crop-share bases. The effect may be seen in a comparison of the firm ownership returns for strategy E with those for strategies B, C, and D. Strategy E never owns more than the original 420 acres of its land resource, while gradually larger proportions of the same quantity of the land resource are owned by the firm in the other three strategies. In the last third of the planning period, strategy E owns the original 420 acres of land, while the other three strategies own all 2,000 of the acres operated. Entrepreneurial returns are the most seriously affected by poor yield years, because the entrepreneurial function gets the residual after investment and ownership returns are deducted. Thus, this return may range from highly positive in a very good crop yield situation to highly negative in a very poor one.

GROWTH IN VALUE OF RESOURCES CONTROLLED

One might be interested in comparing the five land control strategies in terms of the increase in the total value of the resources controlled by the firm over the planning period. Figure 9 shows these relationships. In these

FIRM RETURNS, AVERAGE YIELDS



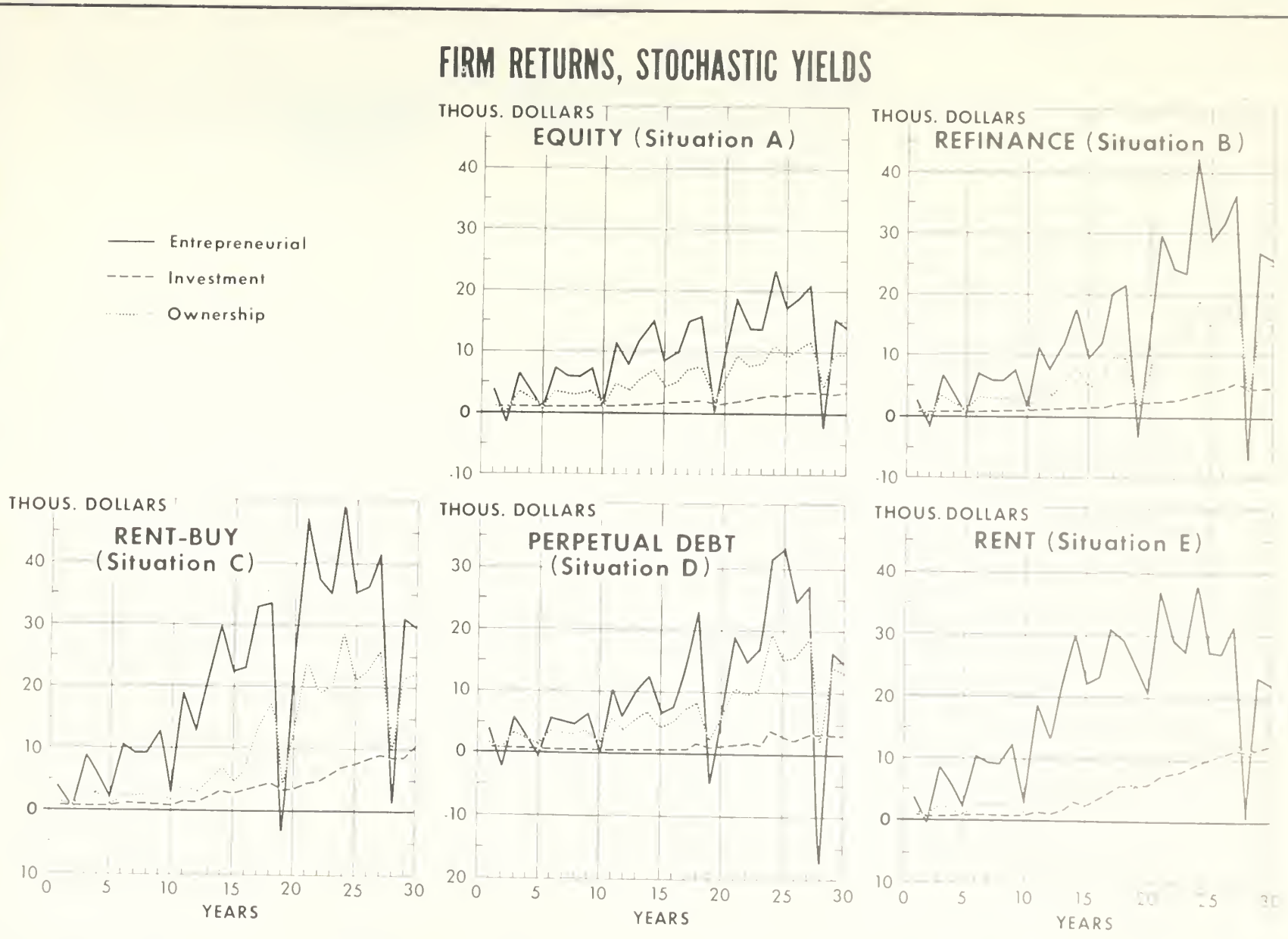

FIRM RETURNS, STOCHASTIC YIELDS
Entrepreneurial
Investment
Ownership
THOUS. DOLLARS
EQUITY (Situation A)
THOUS. DOLLARS
REFINANCE (Situation B)
THOUS. DOLLARS
RENT-BUY (Situation C)
THOUS. DOLLARS
PERPETUAL DEBT (Situation D)
THOUS. DOLLARS
RENT (Situation E)
YEARS
YEARS
YEARS

Figure 8

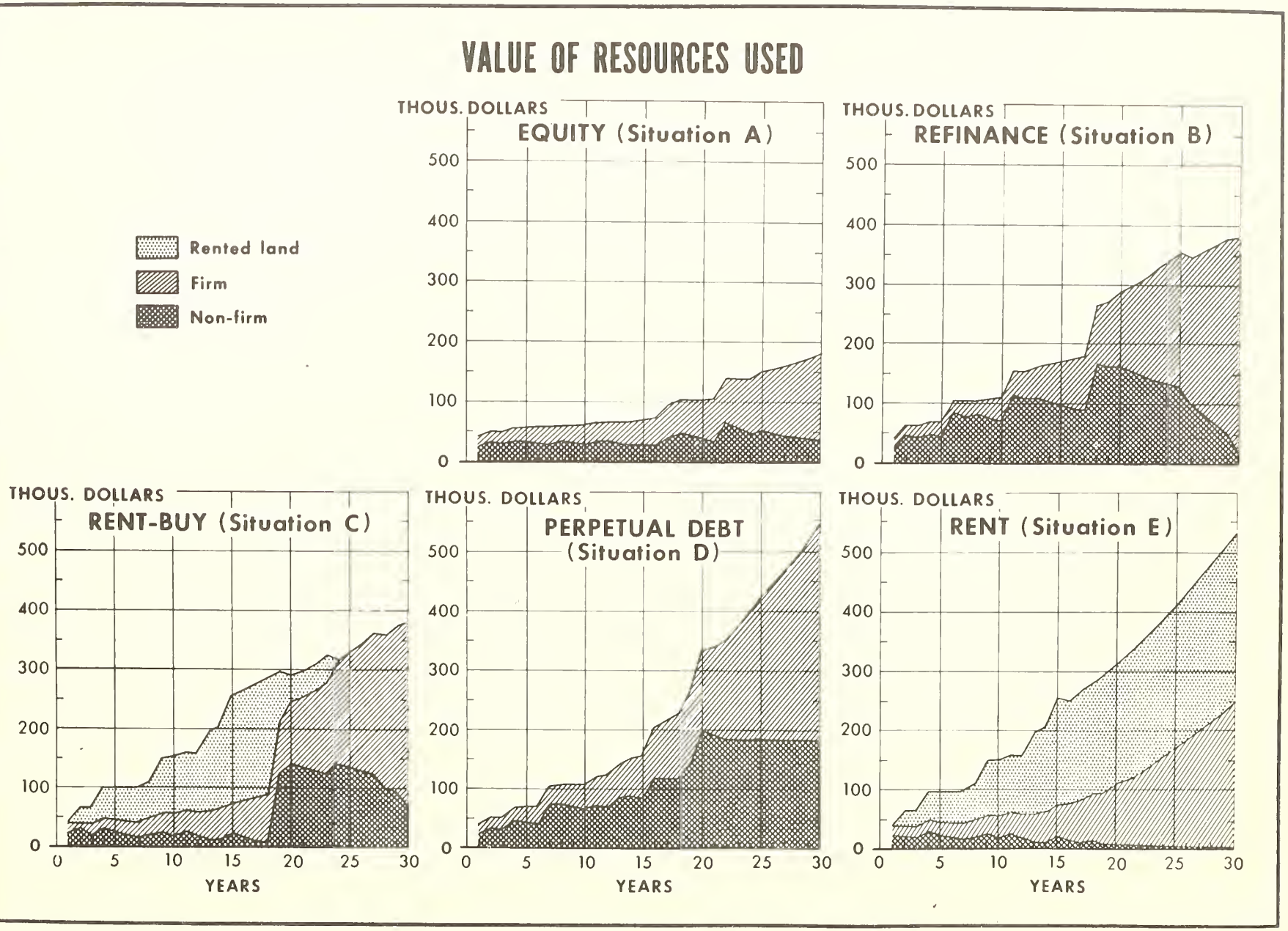

VALUE OF RESOURCES USED
Rented land
Firm
Non-firm
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
0
100
200
300
400
500
0
5
10
15
20
25
30
YEARS

Figure 9

graphs, the value of rented land is shown separately from the values of the remaining exogenously supplied resources, and from firm resources. The values shown are in terms of current prices, and therefore include whatever appreciation or depreciation there has been in the original investment value of resources.

The extremal comparison for these data might be that between situations B and E. Strategy B follows a liberal minimum equity policy to acquire ownership of land, and after the land is owned, a rapid debt repayment policy to increase the firm's proportion of total resources used. By the end of the planning period, the firm controls through ownership all but a small part of the total value of the resources that it uses. Strategy E exhibits something like a geometric progression in both the value of the land that is rented, and in the value of firm resources owned over the period. Under this strategy, the nonfirm investment in firm resources begins at the same modest level as for the other strategies, and declines to zero in the last year of the period. The value of the firm's resources is approximately equal to the value of the land that it rents, and the exogenous investment in nonland resources is zero.

PARTITIONED RETURNS

The data that result from Bailey's partitioning of returns are perhaps most clear when one plots the firm investment, ownership, and entrepreneurial returns for each strategy over the planning period. The following series of graphs reproduce these data in absolute dollar terms. Figure 10 shows firm investment returns for the average and stochastic yield assumptions. Figure 11 shows ownership returns, figure 12 entrepreneurial returns, and figure 13 the total firm returns for these two sets of yield assumptions.

These results might also be expressed as rates of return, similar to the aggregate data presented earlier. The rates of return to firm investment and ownership are calculated as ratios of dollars earned to firm investment, for the investment function, and as dollars earned to firm land investment for the ownership function. The ranges, averages, variances, and standard deviations for these rates of return are given in tables 6 and 7, for the average yield assumption. The average annual rates of return on firm investment are consistent with the assumptions used in this partitioning process. The rate of return on total investment is imputed at 4.5 percent, 5.5 percent, and 6.5 percent for land, machinery, and operating money respectively. The charges for exogenous investment (credit) in these categories is uniformly charged at a rate one-half percent higher than these imputed opportunity rates.

The rate of return to investment in firm ownership of land resources includes the capital gains component. The average rates of return to firm ownership of land are uniform for all strategies except D, the perpetual debt situation. In this case, the firm investment in land is a minimal 30 percent, but all of the capital gains component of the land price increase shows up in the firm ownership of land returns. The financial leverage of such a situation is quite large, indicated by the average return of 47 percent per year on the firm investment in the land resource calculated in this example. As in table 2, the assumptions behind the linear fit of the average and variance statistics shown in table 7 are questionable for the ownership rates of return. The capital gains component has a built-in geometric progression over the 30 years of this time series.

One might choose among several rates of return to the entrepreneurial function, depending upon one's particular interest. Grocery firms and other such businesses like to compute something that they call "net returns on sales." The equivalent datum for entrepreneurs operating farm firms might be the ratio of entrepreneurial returns to the gross farm product. This rate-of-return measure is tabulated in table 8. The average annual rates of return on the volume of the farm production business are around 30 percent, and the two strategies involving land rental show higher average rates of return to the entrepreneur than those in which all of the firm land resource is owned.

A second measure of entrepreneurial effectiveness might be annual entrepreneurial return as a percentage of firm investment. This would indicate the efficiency with which the entrepreneur combines resources and services of the firm, in the generation of the residual returns. Table 9 gives these data. The rates here are generally less than those using gross product as a denominator, but they show a

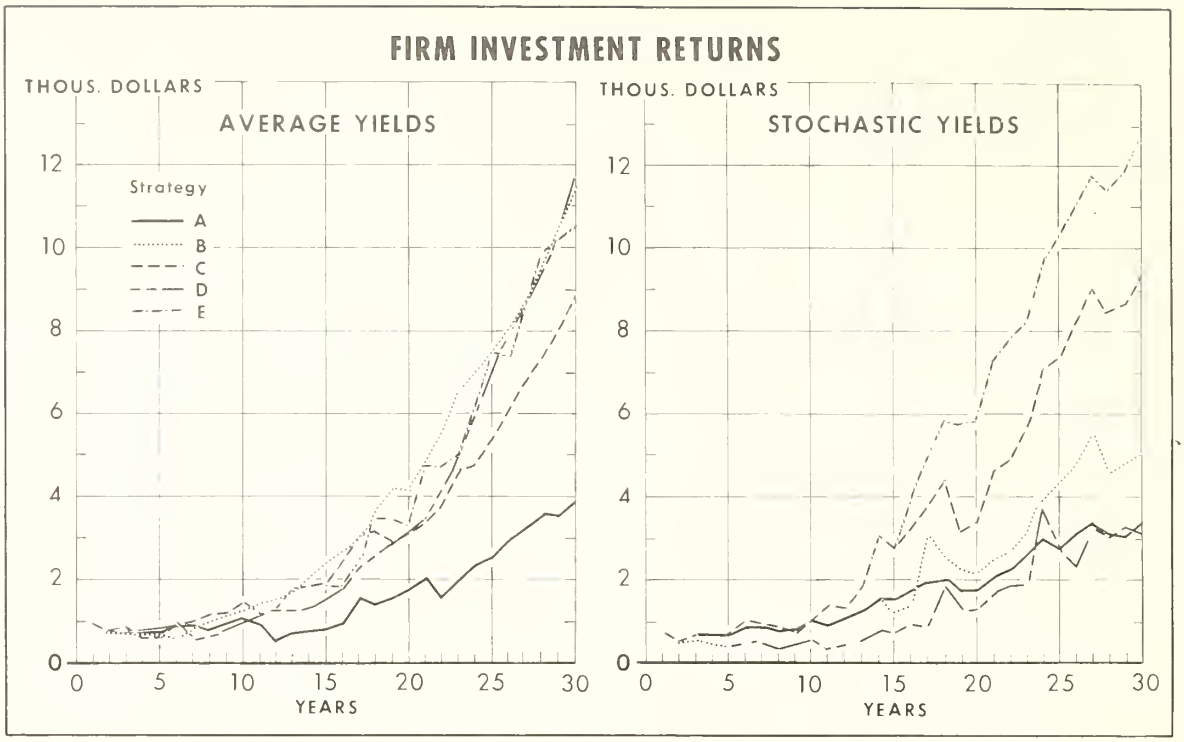


Figure 10

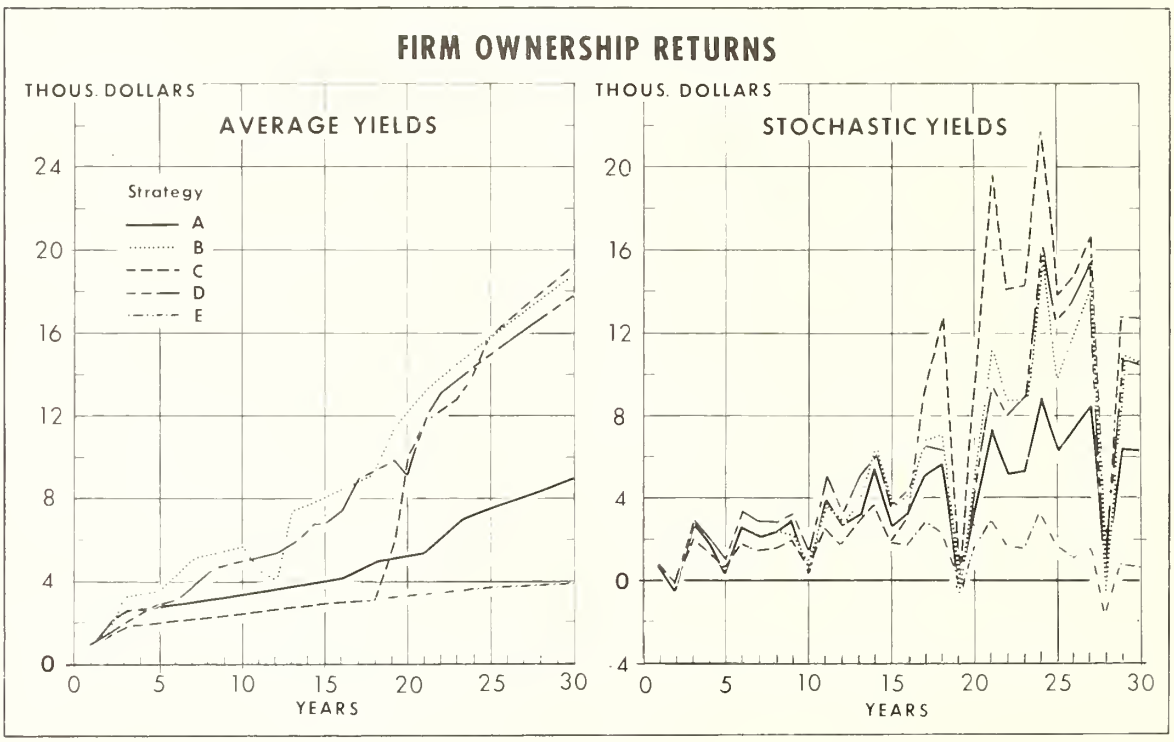


Figure 11

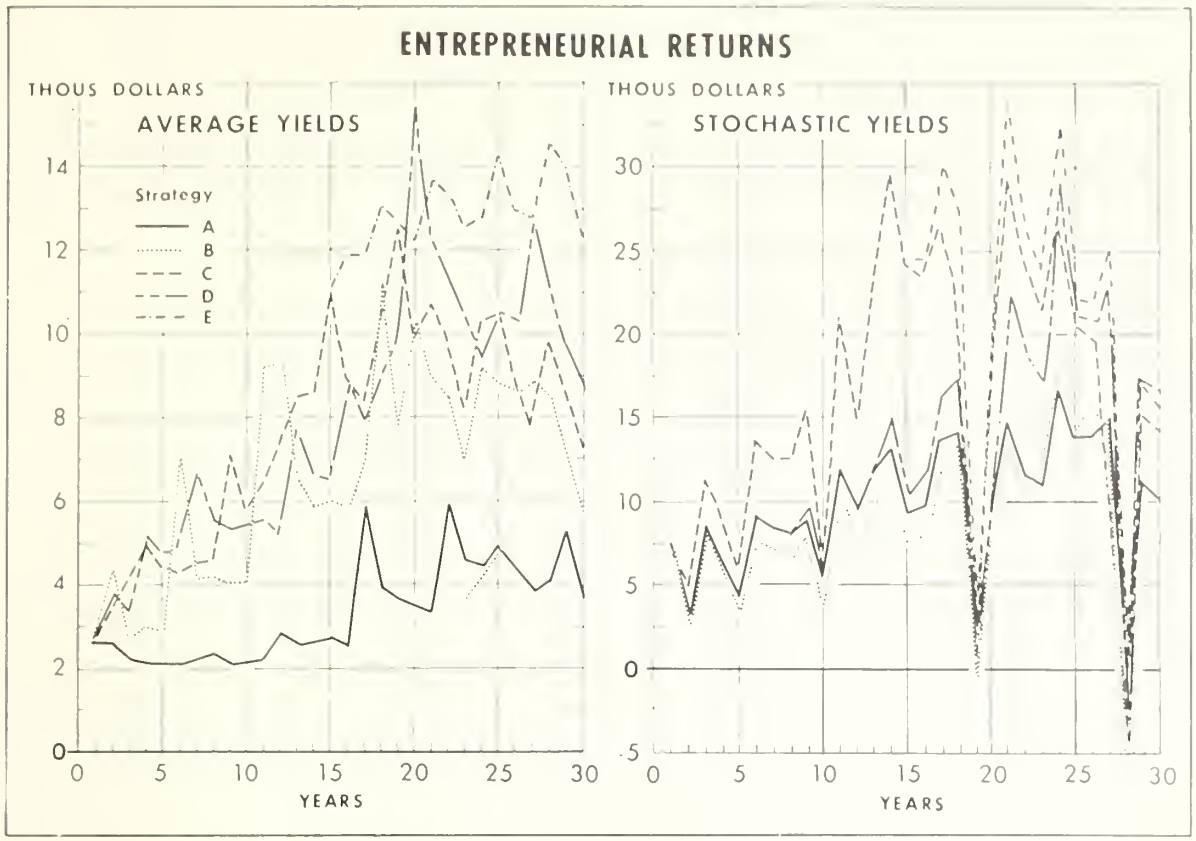


Figure 12

Table 6.--Ratio of firm investment returns to firm investment, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
			Percent		
A (equity).....	5.4	2.2	3.9	.74	.187
B (refinance-buy).....	5.4	2.5	4.0	.58	.144
C (rent-buy).....	5.4	3.8	4.5	.04	.008
D (perpetual debt).....	5.4	2.8	4.2	.69	.162
E (rent).....	5.6	3.8	4.7	.48	.101

Table 7.--Ratio of landownership returns to firm land investment, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
			Percent		
A (equity).....	15.5	5.5	13.2	1.73	.131
B (refinance-buy).....	21.4	5.5	14.0	4.26	.304
C (rent-buy).....	16.5	5.5	12.7	0.64	.050
D (perpetual debt).....	94.4	6.0	46.7	27.14	.581
E (rent).....	14.2	5.5	12.8	1.43	.111

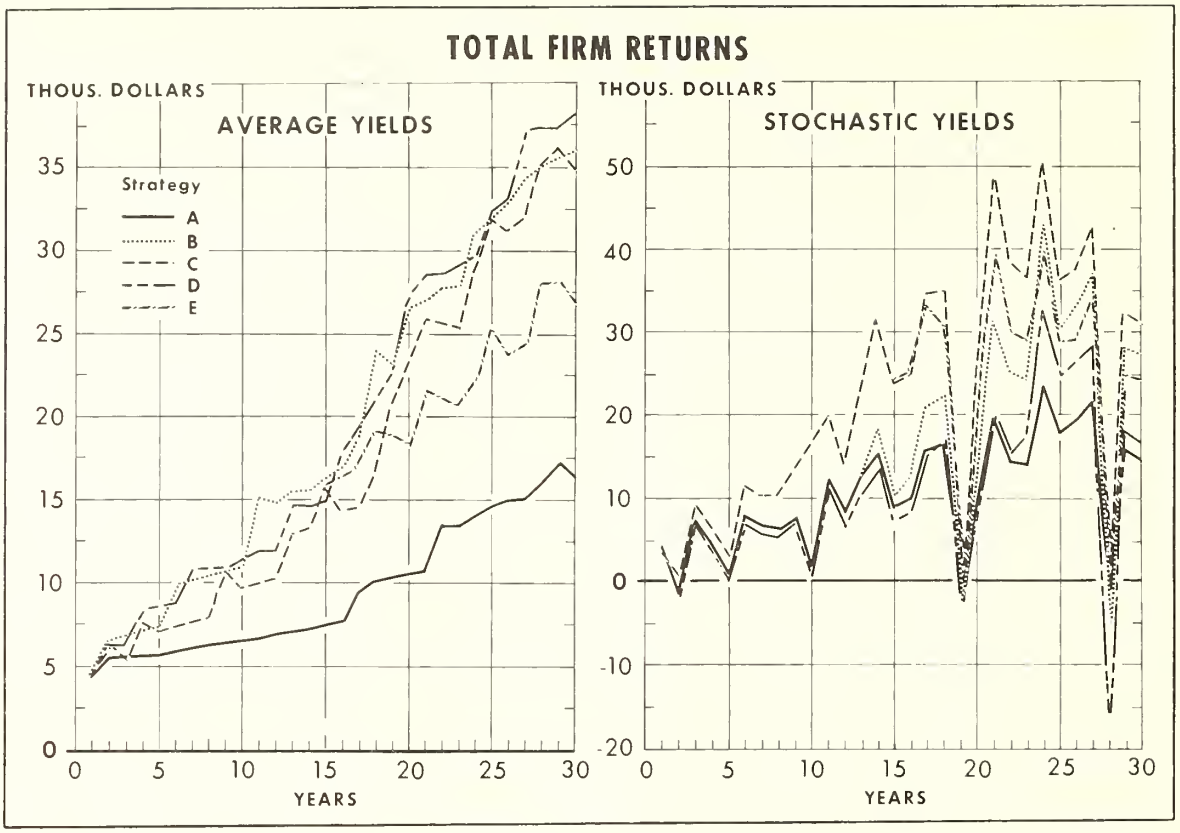


Figure 13

Table 8.--Ratio of entrepreneurial returns to gross product, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Percent				
A (equity).....	31.5	25.8	29.1	5.69	.195
B (refinance-buy).....	30.9	21.8	27.8	2.17	.078
C (rent-buy).....	37.3	24.6	31.8	3.42	.107
D (perpetual debt).....	38.1	24.4	29.8	11.40	.382
E (rent).....	37.5	30.4	34.7	6.33	.182

Table 9.--Ratio of entrepreneurial returns to firm investment, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Percent				
A (equity).....	17.6	8.4	13.5	6.68	.494
B (refinance-buy).....	27.2	5.4	15.0	17.52	1.168
C (rent-buy).....	44.5	7.7	25.7	37.70	1.466
D (perpetual debt).....	30.2	7.0	18.8	6.43	.342
E (rent).....	44.8	9.8	26.6	11.03	.414

Table 10.--Ratio of entrepreneurial return to annual value of resources controlled, five land control strategies

Strategy	Maximum	Minimum	Average	Variance	Coefficient of variation
	Percent				
A (equity)	.56	.38	47.4	[illegible]	.[illegible]
B (refinance-buy)	.52	.3[illegible]	42.4	[illegible]	.[illegible]
C (rent-buy)	.[illegible]	.33	42.5	[illegible]	.[illegible]
D (perpetual debt)	.[illegible]	.28	41.2	[illegible]	.[illegible]
E (rent)	.60	.42	52.2	[illegible]	.[illegible]

Table 11.--Ratio of entrepreneurial returns to acres operated, five land control strategies

Strategy	Maximum	Mimimum	Average	Variance	Coefficient of variation
	Dollars per acre				
A (equity)	9.50	5.15	6.84	1.29	.188
B (refinance-buy)	7.85	4.90	6.50	0.91	.140
C (rent-buy)	8.85	5.40	7.41	0.98	.132
D (perpetual debt)	8.45	5.40	6.92	0.77	.111
E (rent)	10.90	5.40	8.22	1.67	.203

similar advantage for the two strategies utilizing rented land. The advantage might result in large part from the fact that the use-rights to land are a deduction for income tax purposes when they are paid to an exogenous firm, but are not deductible when they are an intrafirm cost.

A third measure of entrepreneurial efficiency would be the ratio of annual entrepreneurial returns to the annual value of the total resources controlled. Table 10 gives these data. One would have difficulty in choosing the most efficient strategy of land control with respect to this measure. There are slight differences in the average annual rate of return and in the variability of these rates, but the differences are not great.

Researchers concerned about entrepreneurial returns related to the acreage scale of the farming operations might calculate statistics based on the ratio of entrepreneurial returns to acres operated. Table 11 reports these data. Again, the averages do not differ greatly, but rental strategies 3 and 5 seem to have an advantage of about $1.50 per acre operated over the ownership strategies.

V. GROWTH IN EQUITY AND NET WORTH

FIRM NET WORTH

The data that result from Bailey's method of partitioning returns may be used to assess the effectiveness of the selected land control strategies with respect to equity and net worth as firm goals, as well as the returns goals discussed above. Figure 14 shows the increases in firm net worth for the five strategies under the average yield assumption, and under the stochastic yield assumption.

Figure 15 plots firm net worth, cumulative firm investment, and the total value of resources used by the firm in its activities. The difference between the firm net worth and the total resources value curves is the exogenous investment used by the firm. This includes credit used by the firm and the value of the land that it rents. Figure 16 gives the same data generated under the stochastic yield assumption.

The net worth curve in these graphs includes the effect of reinvested annual cash surpluses, and the changes in the current values of previous

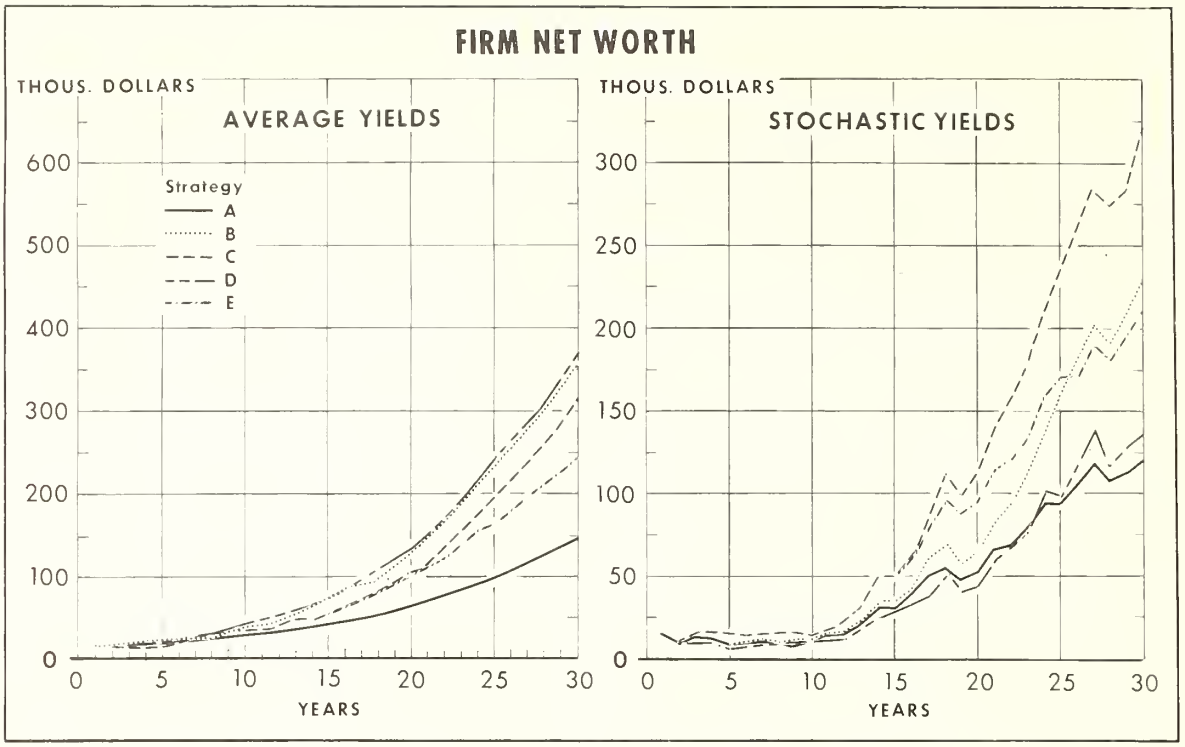


Figure 14

investments, positive for land and negative for machinery. It should also be noted that the current value of the machinery inventory is based on a 7- to 10-year depreciation from original investment cost, while the replacement cost of the machinery is inflating by 2 percent per year concurrently.

Strategy B shows a very slight difference between the cumulative value of firm investments and firm net worth up to year 18. This reflects the policy of refinancing the land indebtedness every few years, and of using the captured capital gains as a downpayment for an increased land ownership. After year 18, the scale goal has been achieved and the strategy becomes one of transferring land investment from the exogenous to the firm sectors as rapidly as possible, by means of prepayments on the mortgage. The difference between the investment value of resources and firm net worth grows rapidly, at an increasing rate, from year 18 until the end of the planning period. Strategy B under the stochastic yield assumption shows a similar pattern beginning in year 21, with the generally lower rate of accumulation characteristic of this yield series.

FIRM EQUITY

Firm equity, defined as the ratio between n worth and the current value of firm resource is plotted for each of the five land contr strategies in figure 17. Judging from these dat one might reasonably hypothesize that the mo appropriate means toward the goal of grow in firm equity is not the restricted and su posedly direct route defined for strategy A. Tl 79 percent of equity achieved by this strate is exceeded by all others with the exception D. The rental strategy E achieves full equi in the last year of the period; the refinancir strategy B achieves 94 percent equity; and tl rent and later purchase strategy C exceec strategy A in the last year of the period. Pei haps the most interesting aspect of these da is not the levels of equity achieved, but rathe the patterns of growth in equity for variou strategies, in relation to the total resource employed.

INVESTMENT LEVERAGE

The last point relates to the concept of ir vestment leverage. This is the ratio of tot

INVESTMENT, NET WORTH, AND RESOURCE VALUE, AVERAGE YIELDS

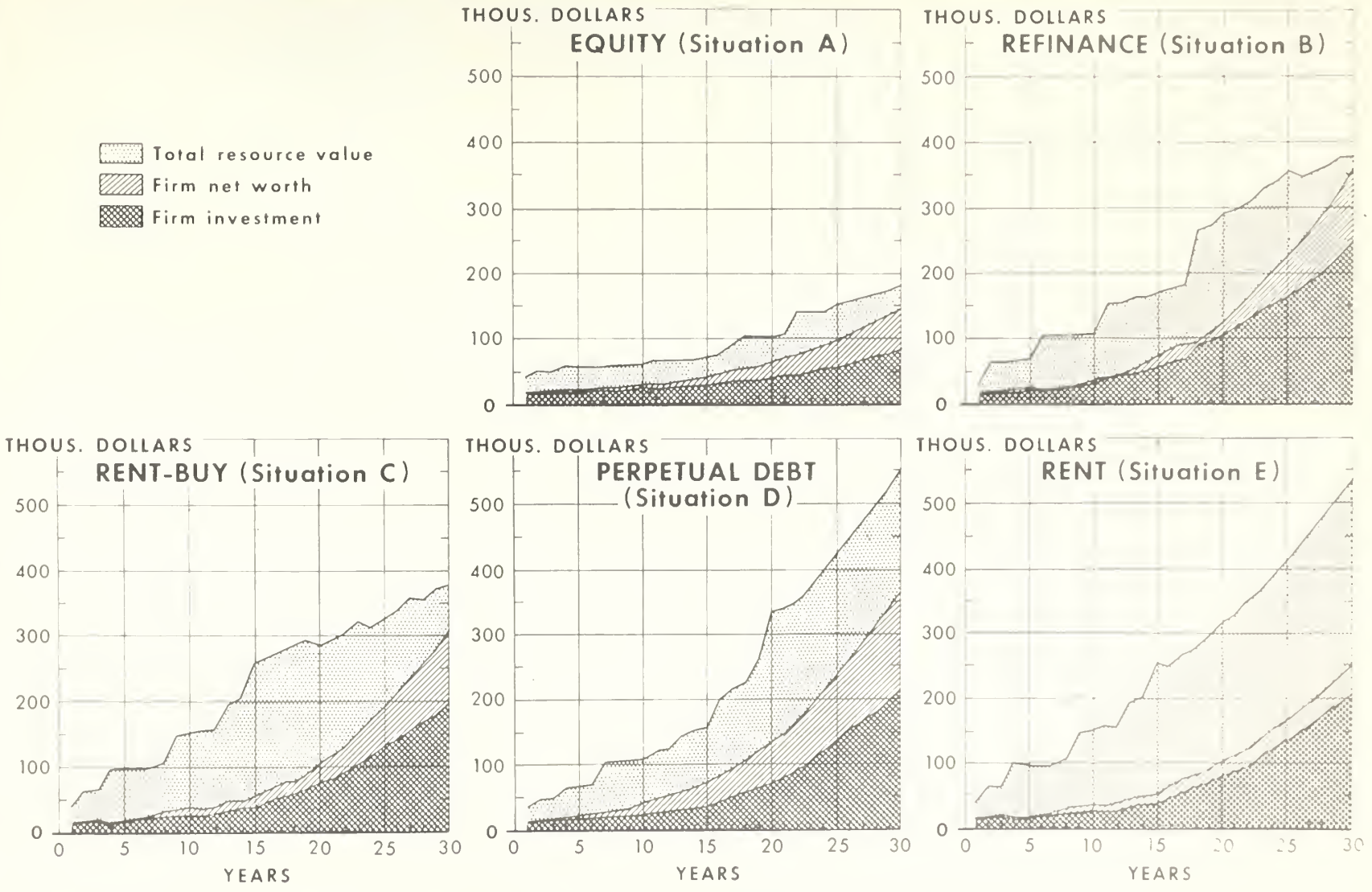


Figure 15

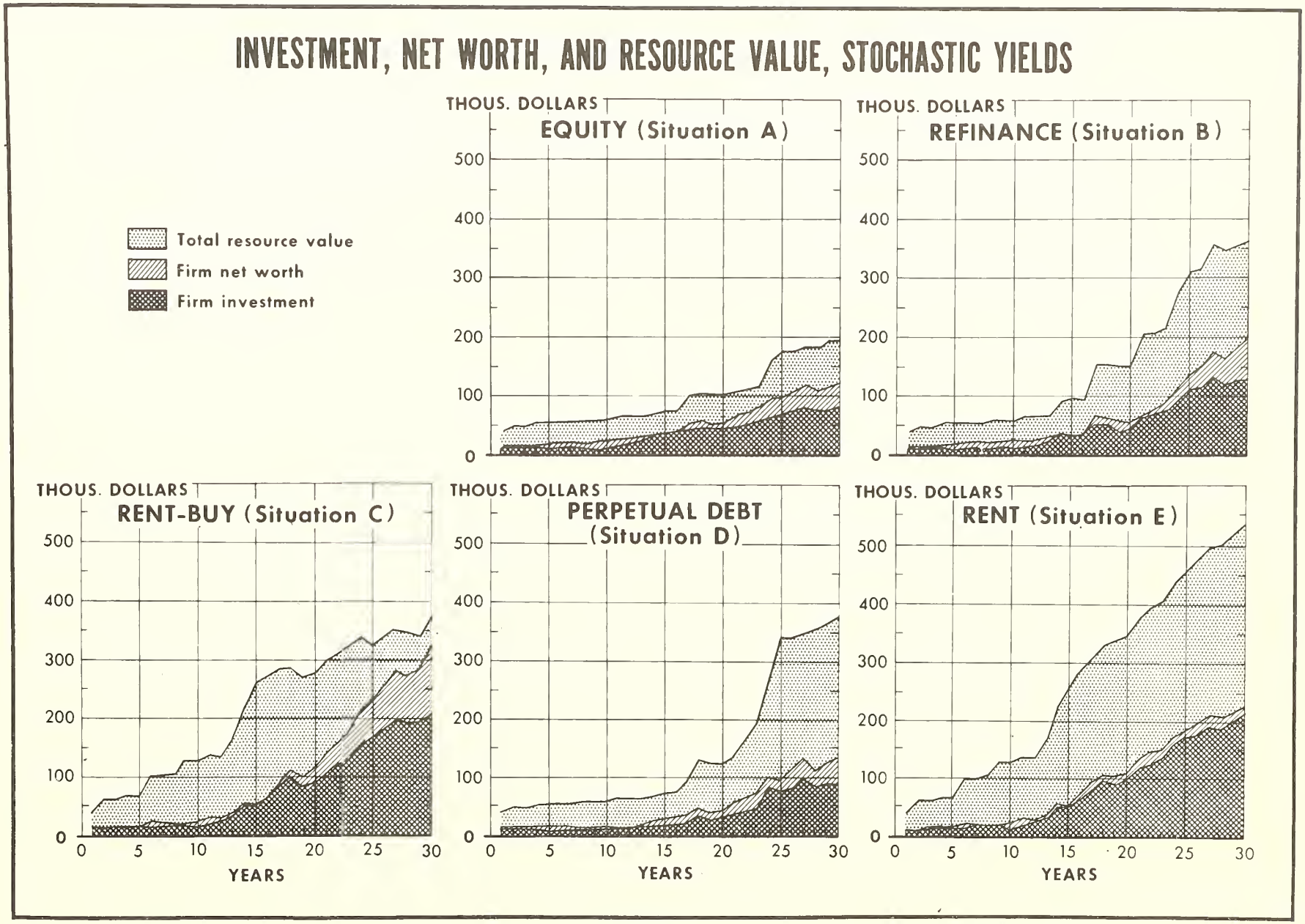

INVESTMENT, NET WORTH, AND RESOURCE VALUE, STOCHASTIC YIELDS
Total resource value
Firm net worth
Firm investment
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
0
100
200
300
400
500
0
5
10
15
20
25
30
YEARS

Figure 16

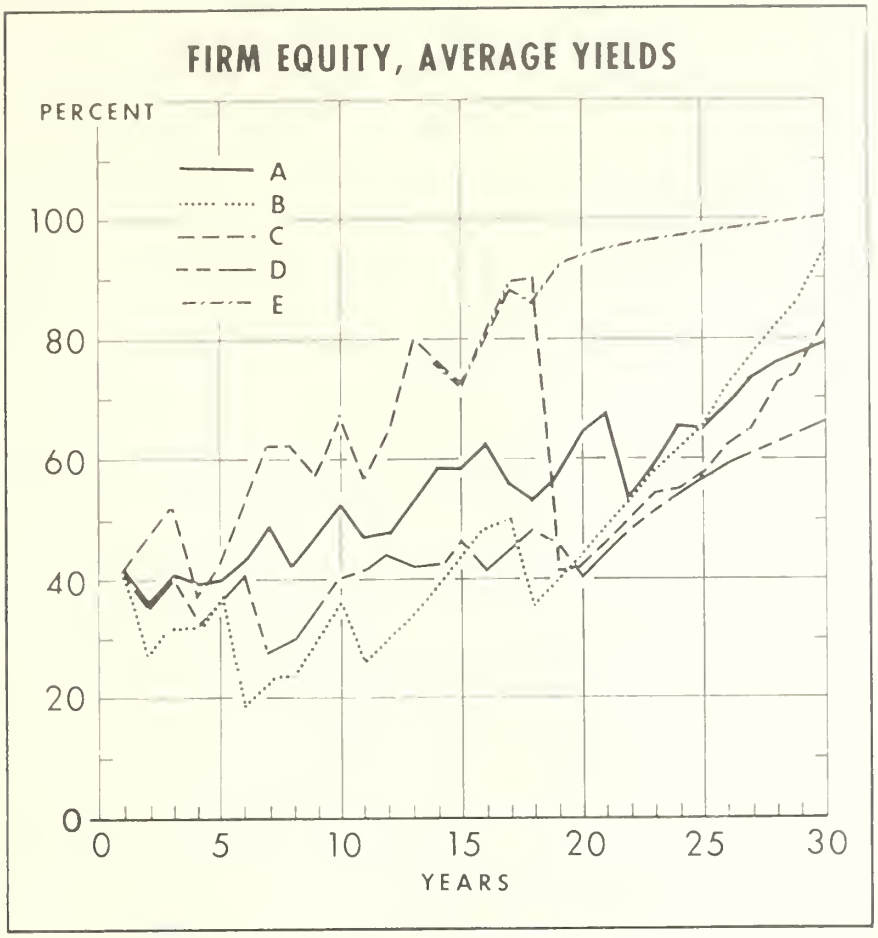


Figure 17

resources controlled by the firm to the investment value of the firm's resources. The ratios that result from this calculation are plotted in figure 18. The differences in investment leverage are substantial, either for a given strategy in different years, or for the different strategies in the same year. As an example, in year 15 strategy A is using $2.38 worth of total resources for every dollar of firm investments, while strategy C is using $6.80 per dollar of firm investment. Although an average annual investment leverage ratio may be misleading under the highly variable conditions of this example, one might nevertheless treat such a datum as indicative, in a general way, of the leverage generated by a given strategy. These average annual investment leverage ratios are as follows: (A) $2.56, (B) $2.88, (C) $4.26, (D) $3.69, and (E) $4.36.

VI. GROWTH EFFECTS ON CREDIT AND CASH FLOWS

CREDIT

Credit is exogenous money used by the firm for some period and purpose. Exogenous infusions of money may substitute for allocations of firm money, or reinvestable cash surpluses, over either the short or the long run. In this example, the firm cannot show a positive return to the investment function for exogenous money, since the interest it must pay is defined to be higher than the opportunity rate of return for intrafirm investments. Exogenous money over the short run is, in this example, a substitute for temporary shortages of firm money required for machinery or production expenses. Whatever leverage effect results from this use of exogenous money is an accident.

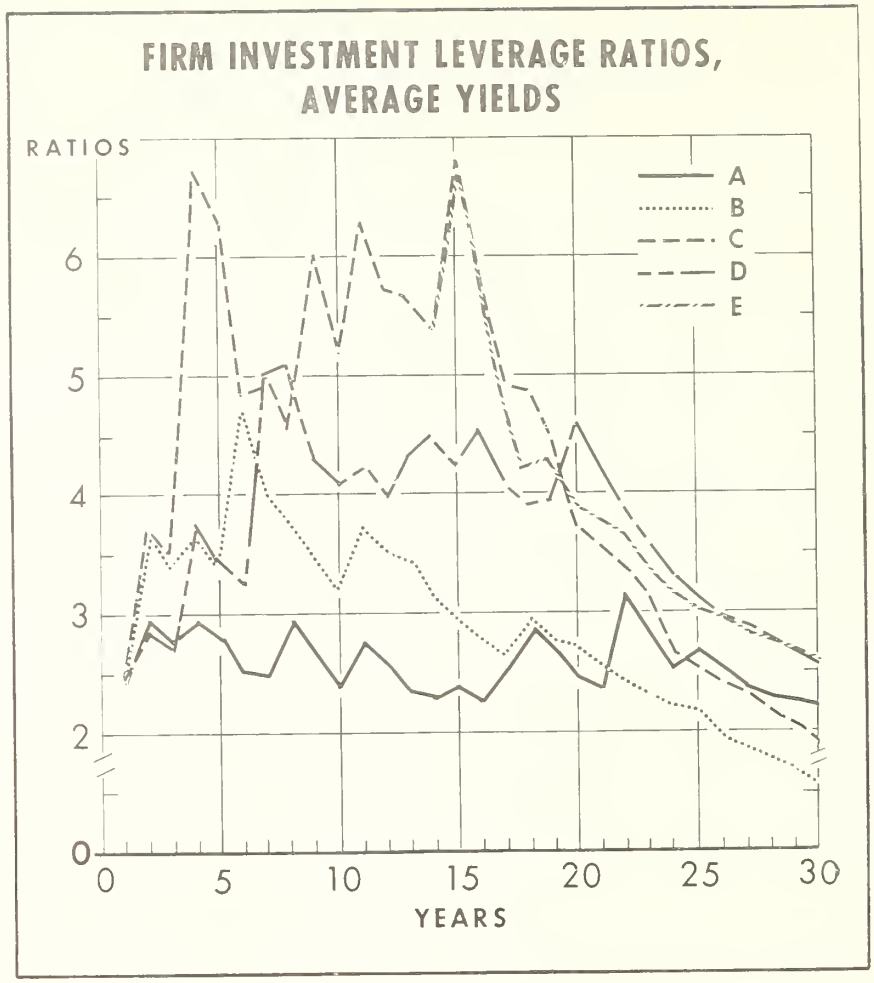


Figure 18

Through the use of long-term exogenous money, investment leverage is intentionally provided in this system. The resulting positive balance does not show up in the investment returns for the firm, but may add either to ownership or to entrepreneurial returns.

The three categories of credit allowed in this system were those for production expenses, machinery, or landownership. The credit used under the various strategies is shown in figures 19 and 20 for the average and stochastic yield assumptions respectively. The mortgage credit curves on the graphs are marked by occasional sharp upward discontinuities. These discontinuities indicate new infusions of exogenous money that are allocated to land purchase. The jump at year 11 in strategy B, average yield assumption, is a case of land mortgage refinancing to pay for machinery rather than additional land investment. The use of both production and machinery credit is minimal in this example, because of the assumptions built into the model.

If this model had been complicated with a set of variable strategies for credit use, as well as for land control, the results might well have been more dramatic for entrepreneurial returns than those calculated in this example. One might hypothesize that the leverage effect of operating credit on entrepreneurial returns more than offsets the slight penalty to the investment returns. If so, then a strategy requiring a consistent financing of cash production expenses by exogenous short-term investments should produce greater entrepreneurial returns than those produced here. One might also hypothesize that the repayment period of 2 years required for exogenous machinery investments

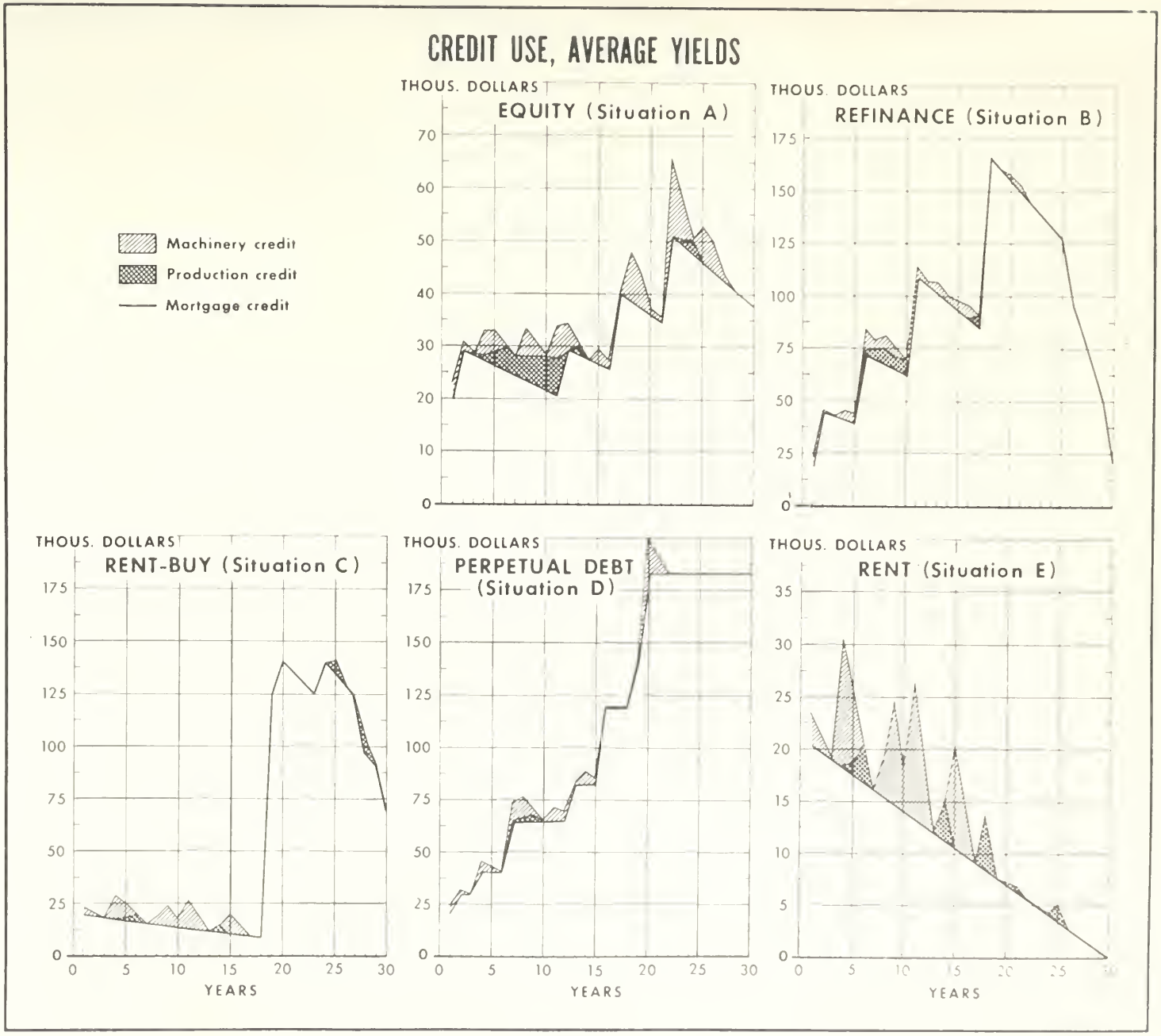

CREDIT USE, AVERAGE YIELDS
Machinery credit
Production credit
Mortgage credit
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
YEARS

Figure 19

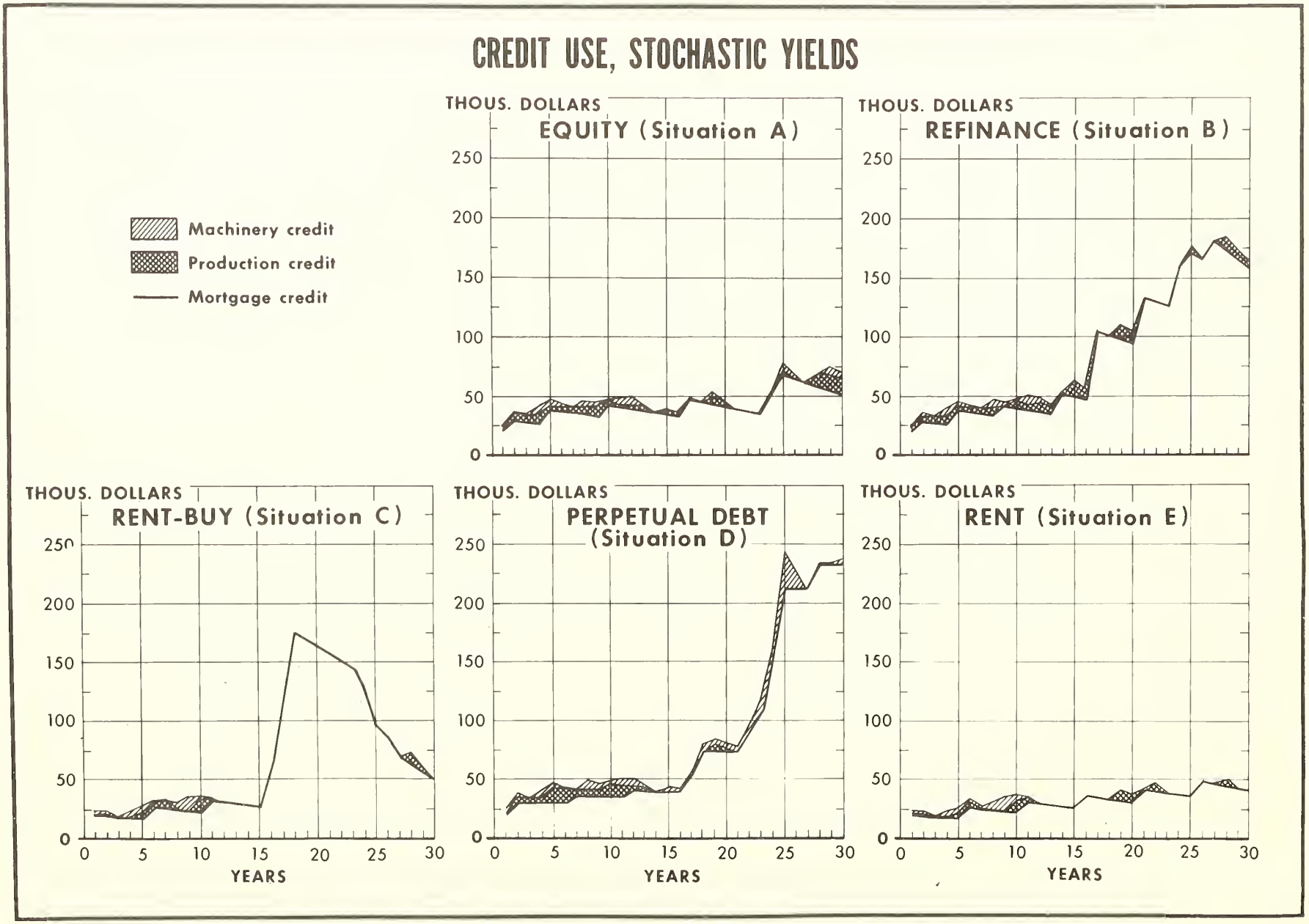

CREDIT USE, STOCHASTIC YIELDS
Machinery credit
Production credit
Mortgage credit
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
0
50
100
150
200
250
0
5
10
15
20
25
30
YEARS

Figure 20

is too short. If so, then a variable strategy allowing for longer periods of repayment of loans for the purchase of machinery ought to increase entrepreneurial returns. If one were to add a machinery leasing or rental strategy for items other than the combine (a custom-hired service in this model), a similarly upward bias might be observed in the entrepreneurial returns.

CASH FLOWS

The annual cash flows through a firm would seem to be a legitimate area of research in farm financial management, although they were not the subject of this example. One may winnow such data from the calculations by which returns are partitioned, and may subject them to scrutiny as derivative results. These flows are graphed for the average and stochastic yield assumptions as figures 21 and 22 respectively.

It should be emphasized that cash flows are only peripherally related to the returns computed for the investment, ownership, and entrepreneurial functions. One may not compare the cash flows to these functional returns in any given year in a direct way. Cash production costs are certainly included in cash outflows, and they are central to the process of reducing ownership to entrepreneurial returns. The capital gains potential on land ownership is not usually a cash flow item, but may be so in those years when land is refinanced, and these gains realized. The cash outflow for consumption is used in this model as a reasonable substitute for the noncash labor wage allocable to the farm family.

The cash outflows in these graphs for credit and interest payments (debt-servicing), and for land and machinery investments, may be wholly or partly offset by infusions of exogenous money; for example, by new credit receipts. The curves appearing in these graphs are the gross cash outflows, and do not equate in any necessary way with the gross cash inflows in any given year. The inflow produced as gross firm product is included in these data to suggest the net cash surplus or deficit position of the firm in any given year. But even this is not a precise indication, because the firm is allowed to carry surplus cash over from one year to the next. Cash carried over between years becomes commingled with cash flowing in from current production and financial activities, and the precise relationship between cash flow and returns to the investment, ownership, or entrepreneurial functions becomes fogged by this continuing inventory.

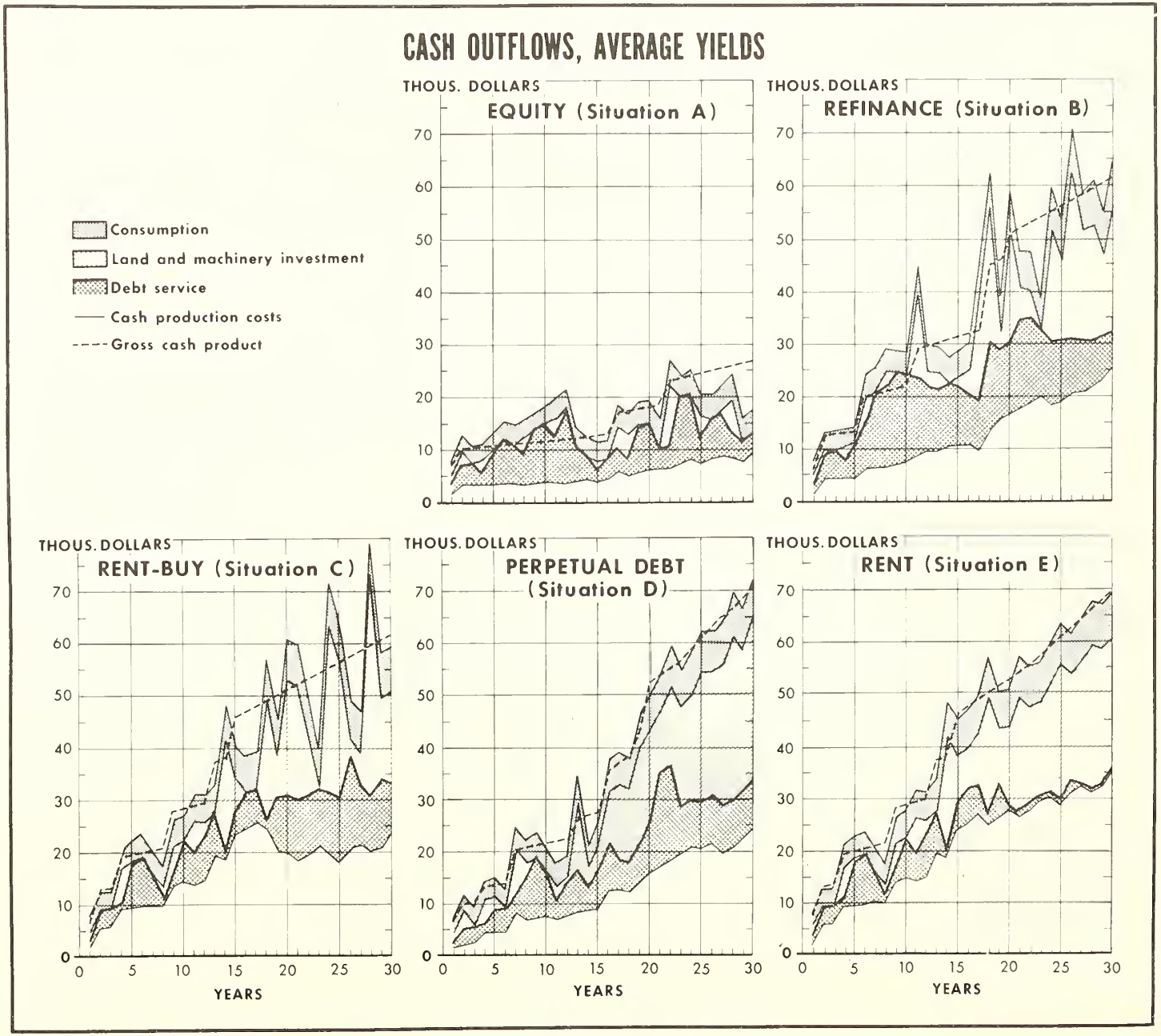

CASH OUTFLOWS, AVERAGE YIELDS
Consumption
Land and machinery investment
Debt service
Cash production costs
Gross cash product
THOUS. DOLLARS
EQUITY (Situation A)
REFINANCE (Situation B)
RENT-BUY (Situation C)
PERPETUAL DEBT (Situation D)
RENT (Situation E)
0
10
20
30
40
50
60
70
0
5
10
15
20
25
30
YEARS

Figure 21

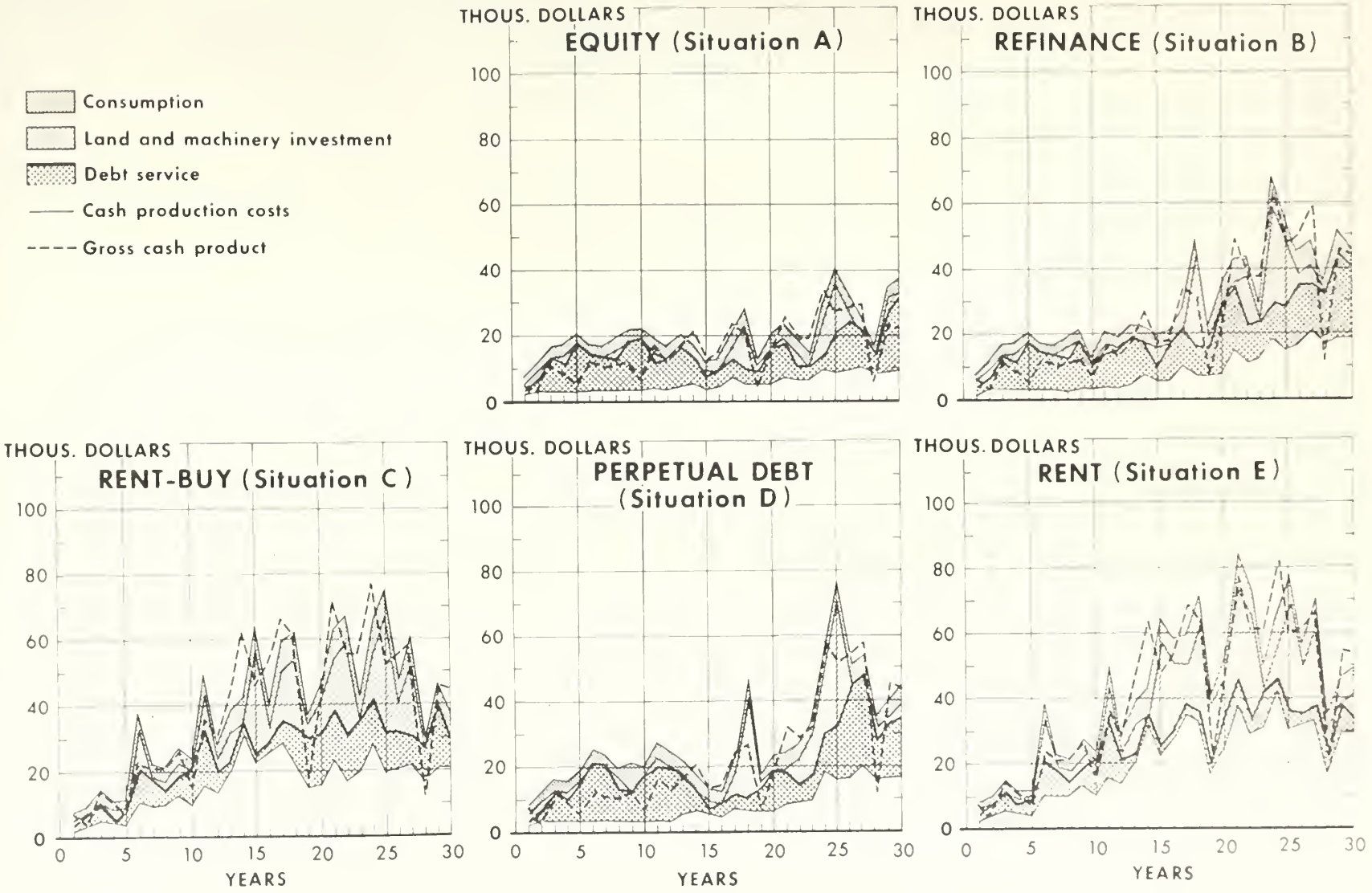


Figure 22

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